FOR
BETTER MANAGEMENT
OF
PLANT OPERATIONS

FACTORY

april 1961

PRICE ONE DOLLAR

A McGRAW-HILL PUBLICATION

DESIGN OF A TROUBLE-FREE FLOOR
p. 74

SURVEY OF PRODUCTION CONTROL
p. 80

PORTABLE AIR TOOLS
p. 96

COVER STORY
MECHANIZATION SPURS QUALITY
p. 70

spray guns from DeVilbiss apply almost anything that pours—far faster than any contact-application methods. They're part of DeVilbiss' complete line of matched equipment for coating and finishing, that includes: dip and flow coaters, air compressors, air and fluid hose, spray booths, industrial ovens, spray washers, air-replacement units, dust collectors, "turn-key" finishing systems.

Talk to DeVilbiss about all your spray-coating requirements

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THE DeVILBISS COMPANY, Toledo 1, Ohio. Also Barrie, Ontario; London, England; São Paulo, Brazil. Branch offices in principal cities.

For more facts circle 404 on READER SERVICE CARD

Hot stuff served up on rubber

Improved B.F.Goodrich belt saves customer $5500 in 13 months

THE cargo on that belt was causing plenty of trouble in this zinc plant. It's a highly abrasive sinter mix—still so hot at this point that it used to burn out belts after only 4 months' service.

When a B.F.Goodrich distributor heard about the trouble, he recommended a new kind of conveyor belt, called Solarflex, designed specifically for handling hot materials. This B.F.Goodrich belt is made of special rubber that stays soft and pliable at hot temperatures that cause other belts to harden, crack and finally break down.

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BFG distributors have full information on this hot-material belt. And, as factory-trained specialists in rubber products, they can answer questions about the many products B.F.Goodrich makes for industry. *B.F.Goodrich Industrial Products Co., Department M-980, Akron 18, Ohio.*

B.F.Goodrich

CONVEYOR BELTS

FOR BETTER
• PLANT MAINTENANCE & ENGINEERING
• PRODUCTION
• PLANT MANAGEMENT

APRIL 1961

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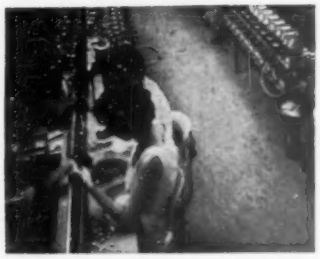

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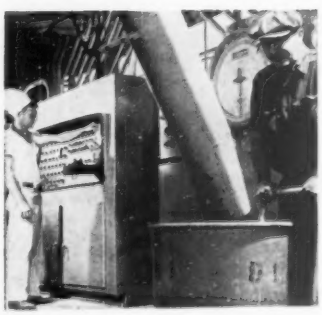

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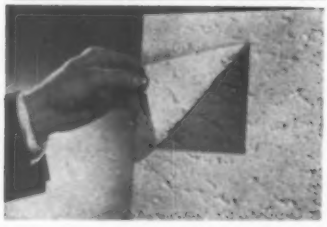

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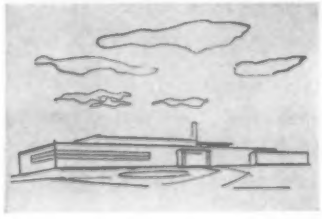

In May the results of a year's intensive search will be revealed when FACTORY presents the winners of its 27th annual competition for the Top Ten plants. These were carefully selected from several hundred of the nation's newest plants. Buildings Editor Oz Stewart traveled thousands of miles to visit the leading contenders. What he saw will give you hundreds of ideas on how your plant can save money right now.

COVER

Division Mechanization Manager F. Lipinski, Mechanization Manager R. Trueb, and Manufacturing Services Manager F. Stote (l. to r.) in Texas Instruments' newly automated Dallas plant.

Painting by Frank Lacano

70TH YEAR OF PUBLICATION
APRIL 1961 Vol. 119 No. 4
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THIS FILING SYSTEM is designed to give quick access to past FACTORY articles that can help you solve your current operating problems. Here's how it works:

1. All major articles (set here in bold type) and many short items are classified according to a functional code. Codes cover basic operating responsibilities.

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For ways to use your Guide, write Reader Service, FACTORY, 330 W. 42nd St., New York 36.

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This 35,000-pound giant is shown handling huge aluminum billets—four at a time.

The new "Acro-Smooth" the most modern, most efficient fork truck you can buy.

An *ELPAR* fork truck for every handling job

1 to 20 tons capacity—with more than 40 standard models

Cut your truck operating costs with ELPAR fork trucks. Built to match the finest equipment in your shop, they need a minimum of maintenance and repair—even on the toughest jobs. And, they run on low-cost electric power.

There is a model for every handling task, and an experienced ELPAR representative to help you pick the best one for your plant.

WRITE FOR THIS CATALOG
Get complete details on all ELPAR fork truck models.

ELPAR
ELECTRIC TRUCKS

The Elwell-Parker Electric Company
4020 St. Clair Avenue
Cleveland 3, Ohio

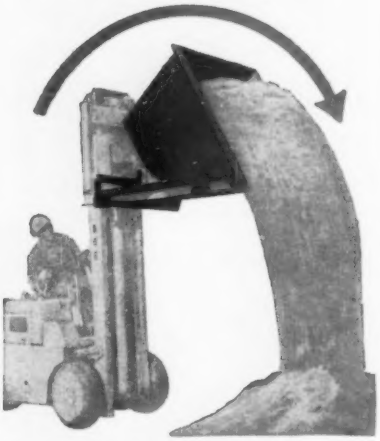
In Canada: International Equipment Ltd.

This is ELPAR's smallest fork truck line, easily maneuvered in narrow aisles.

Handling coils of steel weighing up to 20,000 pounds is a typical job for the ELPAR Titan Series.

Here is a rugged truck for handling heavy loads—yet it's small, fast and highly maneuverable.

FITS ANY LIFT TRUCK
DUMPS
AUTOMATICALLY



CAN CUT HANDLING COSTS 50%

With this self-dumping hopper on your lift truck, one man can do the work of two—in a fraction of the usual time. It's the modern, low-cost way to handle scrap metal, small castings, cinders, punch press parts, hot forgings, cullet—all kinds of bulk material.

DUMPS ITSELF

Attaches in seconds to any lift truck—fork or platform. Can't slip off. Operator picks up loaded Hopper—transports it to its destination—releases the latch—and the Hopper automatically dumps its load, rights itself, locks itself.

RIGHTS ITSELF

LOCKS ITSELF

Roura Hoppers are sturdily made of 3/16" steel plate with continuous arc-welded seams. Heavier plate if desired, also stainless steel or galvanized. Made in eight sizes, ⅓ to 4 yard capacities, mounted on live skids or a choice of wheels. Standard models available for immediate shipment.

ROURA
Self-Dumping
HOPPER

WANT MORE DETAILS? Just clip this coupon to your letterhead and mail to
ROURA IRON WORKS, INC.
1423 Woodland Ave., Detroit 11, Michigan

FACTORY LETTERS

Efficient 3-E formula spells safety

Dear Sir:

"Eyes Saved Are Dollars Saved, Too" (FACTORY, January 1961) is amazing. All I have to do is substitute our company for "Twin Coach Company" and the facts are identical.

We believe safety to be an integral part of production, and the problems usually can be solved by the "3-E formula," education, enforcement, and evaluation: Give the people concerned all the information available, including the reasons for the proposed program; put the plan into action, enforce the rules by continuous follow-up; and finally evaluate the program for its effectiveness. Each of these steps is equally important and the lack of any one of them will defeat the program.

Donald Herder
Asst. Personnel Director, Ingersoll Steel Div.
Borg-Warner Corp., New Castle, Ind.

More on non-destructive test equipment

Dear Sir:

The article on non-destructive testing in the January issue of FACTORY was full of useful information. Also, we appreciate the inclusion of Magnaflux as a supplier of many products for these operations.

However, our name rightfully could have been included in two more method categories.

In relation to the "ultrasonic method," our current model Sonizon (original model introduced about 1947) is a portable, transistorized instrument which, we believe, has the ruggedness and reliability that the article says has been lacking in portable ultrasonic instruments. Its major use is in maintenance testing of metal walls (tanks, piping, and the like) that may have been thinned by corrosion.

Also, we make several types of eddy current instruments for testing with this method.

Franklin S. Catlin
Manager, Marketing Development
Magnaflux Corp., Chicago

A plea for more retiree activity programs

Dear Sir:

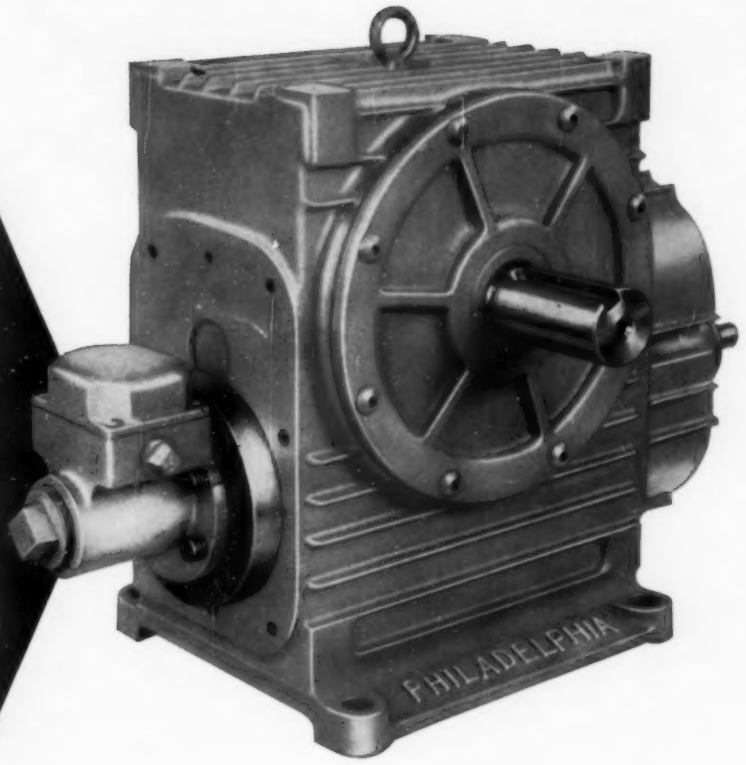
"Old Timers Get a New Lease On Life" (FACTORY, January 1961) was an excellent article. In my work I am concerned over mandatory retirement at age 65. I hope your article will be read by many who can encourage more activity programs such as that of the Royal McBee Corp.

(Mrs.) Alberta D. Walker, O.T.R.
Occupational Therapy Consultant, Los Angeles.

Turn the page

INSIDE!

AN AUTOMATIC SWITCH FOR FAST, SURE PROTECTION AGAINST OVERLOAD

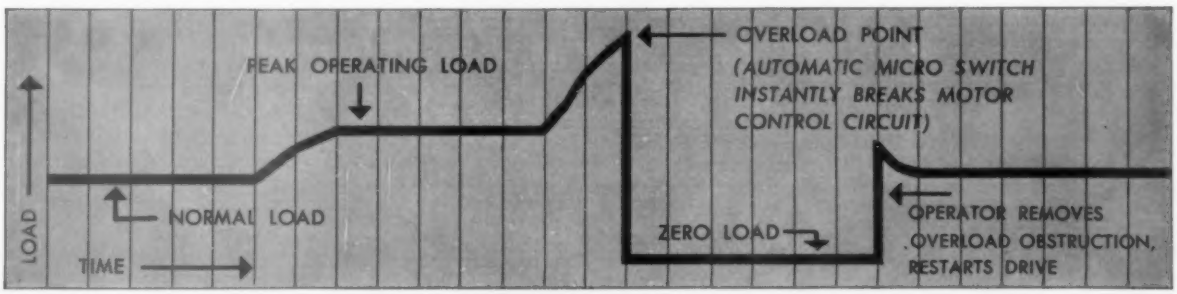


Here is instant protection against overload damage . . . Philadelphia Gear's Torque Control for worm gear reducers. When output torque of the reducer exceeds a pre-set value, the control breaks the motor control circuit—instantly. This is accomplished by mechanical actuation of an electrical line break switch. Truly foolproof protection for driving and driven equipment.

Time saved with Torque Control can be considerable, too. For example, you can remove the cause of overload or jam immediately. There is no waiting for heaters to function or for shear pin replacement. In short, downtime is either drastically cut or eliminated.

How about starting surge? Here, too, is an advantage . . . the control can be by-passed by holding the START push button to permit this temporary overload. Torque Control is optional on Phillie Gear equipment, and is available for either one direction of operation or both.

For information on our complete line of Worm Gear Reducers, write for catalog WG-60.

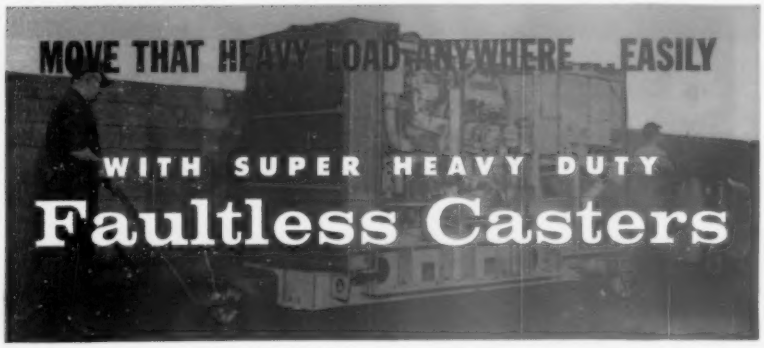


philadelphia gear drives

PHILADELPHIA GEAR CORPORATION

King of Prussia (Suburban Philadelphia), Pennsylvania

For more facts Circle 409 on Reader Service Card



Dreadnaught Casters move loads up to

SERIES 1300
¾" thick swivel top plate. Dust-proof self-contained swivel load bearing. Hardened ground and polished raceways. Timken combined radial and thrust bearing. Thick steel horn with reinforced ribs. Special alloy wheel with two Timken bearings.

7½ Tons
PER CASTER

When it comes to *CASTER STRENGTH* for rolling the big loads along your assembly line, or around your stock pile area, Faultless engineered casters can give a lift to your big production and warehousing problems. Above, a Faultless Series 1300 Swivel Plate Caster and two Faultless wheels in special mountings easily handle a 22,000 lb. Caterpillar Diesel-electric engine with minimum manpower; a usual task for the Faultless Series 1300 Dreadnaught Caster.

Super strong HX300 Casters handle loads up to

5 Tons
PER CASTER WITH 8" WHEEL

For surplus strength to roll under cargoes that break down or damage ordinary casters, the HX300 Series, extra heavy duty swivel caster, will fit your specifications. It's precisely engineered throughout and constructed of quality materials to provide a caster capable of easily taking on 10,000 lb. loads, while keeping production lines moving with minimum handling costs.

SERIES HX-300
1" dia. king pin. Thick steel top plate. Self-contained main load bearing has dust guard and grease seal. Timken radial and thrust bearing. 8" or 10" semi-steel wheels with Timken bearings.

ASK YOUR DISTRIBUTOR: Your nearby Faultless Industrial Distributor maintains a substantial inventory of Faultless Casters for immediate delivery. He and one of the strategically located Faultless Sales Engineers are available to work with you on every handling problem in your plant. Both are listed in the phone book Yellow Pages, under "Casters," and the Faultless heading.

INDUSTRIAL DISTRIBUTORS — SERVING INDUSTRY ECONOMICALLY — THE RIGHT HAND OF PRODUCTION

Faultless Caster Corporation
Evansville 7, Indiana

Representatives in Atlanta, Baltimore, Boston, Buffalo, Chicago, Cleveland, Dallas, Detroit, Grand Rapids, Greenville, S.C., High Point, Indianapolis, Los Angeles, New Orleans, New York, Philadelphia, Portland, St. Louis, Washington, D.C., Canada: Stratford, Ontario.

NOELTING Faultless Casters

Update telephones again

Dear Sir:

"Updating Plant Telephones" (FACTORY, January 1961, page 52) was informative. But you overlooked one new development in industrial mobile telephones.

Our ITT AutoCom is a mobile telephone unit which can be installed in company cars and trucks. It connects drivers with their plant telephone system through standard telephone transmission lines or a company's private radio system. Also, drivers can call other points as required through regular transmission lines.

J. L. Grantland
Sales Manager
Mobile Communications
ITT Industrial Products Div.
San Fernando, Calif.

A case of mistaken identity

Dear Sir:

BMT—not BMC—Manufacturing Corp. makes the equipment described in FACTORY's Case Book cover story in the December 1960 issue (page 143).

Also, the article says the tumblers on the machine "shake, rotate, and revolve." This is incorrect. The barrels are rigidly fixed to a 48-in. steel rotating disk in such a manner that the loads in each barrel slide, roll, slide, and roll with each revolution. This keeps the parts within the mass of the abrasive, which provides controlled abrading action,

FACTORY welcomes opinions and suggestions from its readers. They help us put management problems in better perspective. Letters should be addressed: The Editor, FACTORY, 330 West 42nd St., New York 36.

For more facts Circle 410 on Reader Service Card Circle 411 on Reader Service Card for items on next page

NEW WAY TO CUT PIPE MAINTENANCE COSTS!

RIBBON DOPE (trademark) Thread Sealant by Permacel—the self-lubricating, universal sealant made of pure Teflon* for all threaded connections, metal or plastic . . . including oxygen breathing apparatus.

*Du Pont trademark

PERMACEL®

NEW BRUNSWICK, NEW JERSEY • TAPES • ELECTRICAL INSULATING MATERIALS • ADHESIVES

KALAMAZOO

...worth more to you

For those Special Metal Cutting Jobs

MODEL 824D

Cuts 8-inch round and 24-inch flat stock. The 824D will give you extra capacity for special cutting jobs such as kitchen counter tops, steel mats and other projects where a little extra capacity is required. Accurate and dependable.

MODEL 610D

Cuts 6-inch round and 10-inch flat stock. The 610D gives you maximum capacity, accuracy and portability. Excellent as an on-the-job saw for electricians, plumbers and those in light construction and welding. Has all the features of the larger Kalamazoo models.

Ask your Kalamazoo dealer for details and a demonstration of these two units or any of the other fine Metal Cutting Bench Saws in the Kalamazoo line. Remember, Kalamazoo . . . worth more to you.

MACHINE TOOL DIVISION

KALAMAZOO TANK and SILO COMPANY

461 Harrison Street • Kalamazoo, Michigan

and protects parts from nicks and impingement. More work is done with less media, and less wear on the media.

Donald A. Mosher
President
BMT Manufacturing Corp.
Elmira Heights, N. Y.

Exporting roof revolution

Dear Sir:

We would be grateful if the supplier would send us more information about the spray gun for applying roofing material, described in the August 1960 issue of FACTORY ("Revolution on the Roof," page 95).

L. S. Tippett
General Manager
Westinghouse Rosebery Pty. Ltd.
Rosebery, N.S.W.
Australia

► **We have asked The Flintkote Co., 30 Rockefeller Plaza, New York 20, to send reader Tippett the detailed information requested.—ED.**

FACTORY

April 1961 Vol. 119, No. 4

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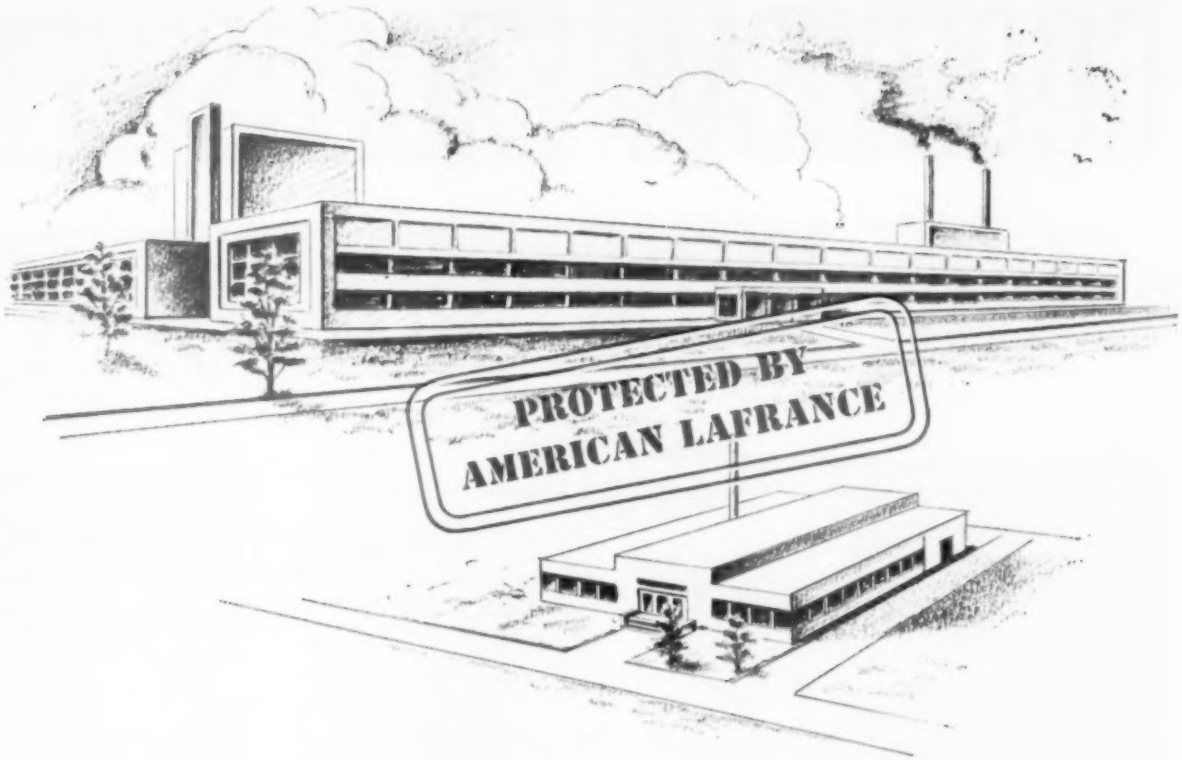

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Whether your plant is large or small, your fire protection program must be correctly designed and engineered to guard against loss by fire. American LaFrance has long been identified as the "*Trusted*" name in positive fire protection service. Long experience and specialized engineering know-how have developed an incomparable advantage in quality equipment and broad application knowledge in the fire protection field.

American LaFrance products cover the entire range of fire protection equipment from small fire extinguishers through complete chemical systems of all types. Regardless of the hazard, you can be sure of sound recommendations providing maximum security from the hazards of fire.

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Dry Chemical, Carbon Dioxide, Foam, Water, Soda-Acid Extinguishers . . . Wheeled Engines . . . Carbon Dioxide and Foam Systems . . . Industrial Fire Apparatus and Supplies. Send for free booklet "First Minute Fire Control" illustrating this equipment.

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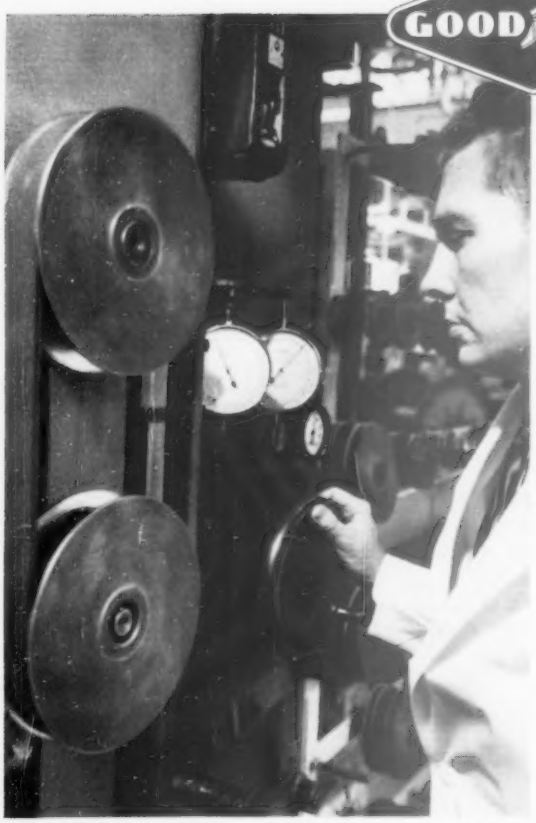
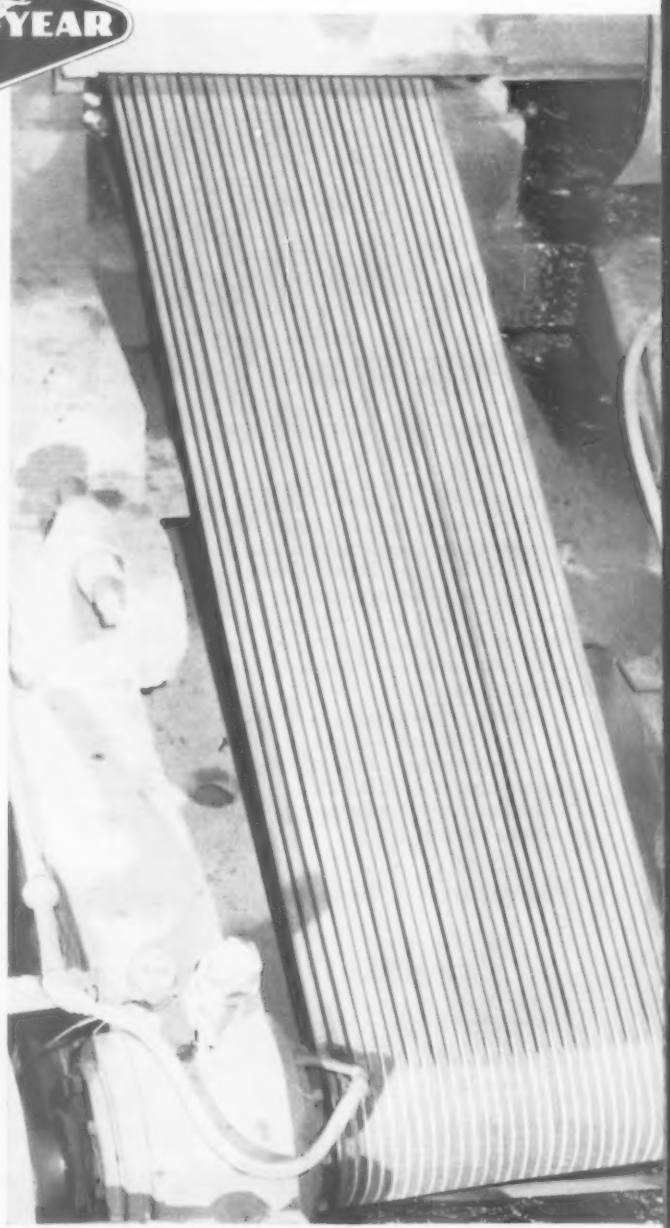
GOODYEAR EXCLUSIVE!

IS YOUR SIGN OF V-



Goodyear V-Belts' precision matching comes from this exclusive close-tolerance matching equipment that length-codes each belt to 1/32″. Most other belt manufacturers code only to 1/10″.



Goodyear V-Belts' precision matching assures standout performance. Example: only 28 COMPASS-V-Steel Belts handle this big steel saw, normally calling for 42 belts. Result: the steel mill saved $500 at the original installation – will save more at every belt change.

THE GREEN SEAL BELTS CODED TO 1/32"

Here's your assurance that every belt in a set matches in length – pulls together for maximum trouble-free horsepower hours

What's more, the Green Seal means –

Dimensional stability that lasts the life of the belt–thanks to shrink- and stretch-resistant "muscles" of 3-T Process Cord or airplane-type steel cable built into each belt.

Satisfactory performance even when subjected to dampness – because of special mildew-inhibited compounds.

The most complete line of V-Belts anywhere today – always within easy reach through a nationwide network of distributor stocks.

The proper selection of V-Belts to meet your requirements with the help of the G.T.M.– Goodyear Technical Man – America's top belting specialist.

So make the GREEN SEAL your sign of savings–in both time and money–by calling your Goodyear Distributor. Or write Goodyear, Industrial Products Division, Akron 16, Ohio.

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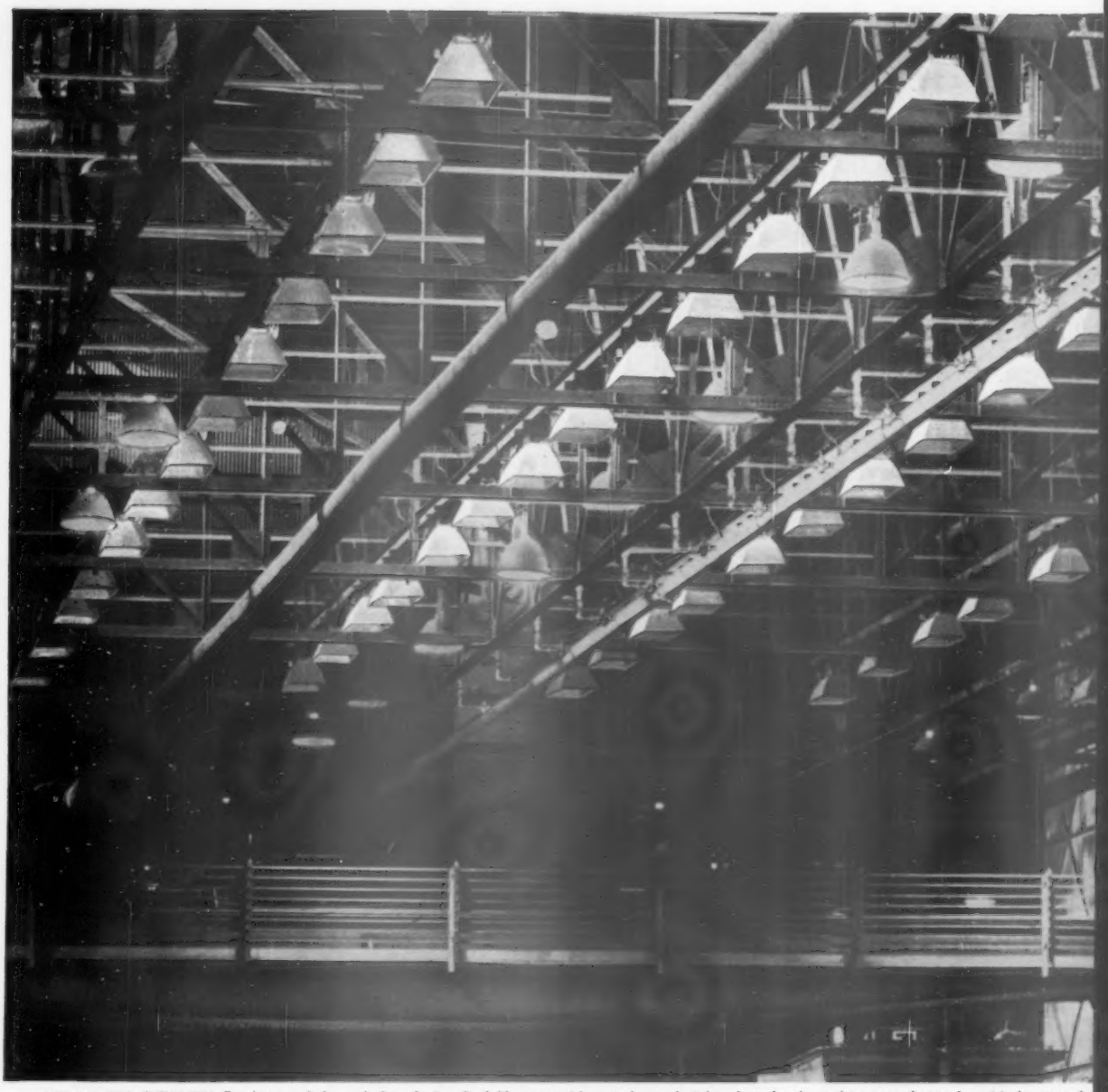
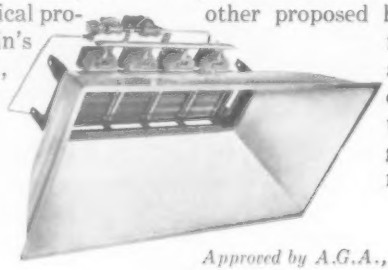


300 (48,000 *BTU/H*) *Perfection Schwank Gas Infra-Red Heaters* Mounted at a height of 36 ft., heat the area of 100 ft. wide by 500 ft.*

J & L Steel Saves 46% in BTU's with

Minimum 55° machinery temperature is necessary to guarantee peak operating efficiency of critical production equipment at Jones & Laughlin's No. 1 Continuous Weld Pipe Mill, Aliquippa, Pa. Replacing their previous heating equipment, 300 Perfection Schwank *Gas* Infra-Red Heaters (600 in the entire plant) meet this tough requirement with a BTU capacity 46% less than any other proposed heating system. Total maintenance requirements consist of air blowing the gas-fired units once each heating season. After three full seasons of dependable gas heat and employee comfort, not one of the 2,400 ceramic



Approved by A.G.A., Underwriters, C.G.A. and C.S.A.

long without partitions or walls to adjoining plant areas. These gas-fired heaters are part of the 600 installed at J & L's Aliquippa Works.

Perfection Schwank Gas Infra-Red Heaters

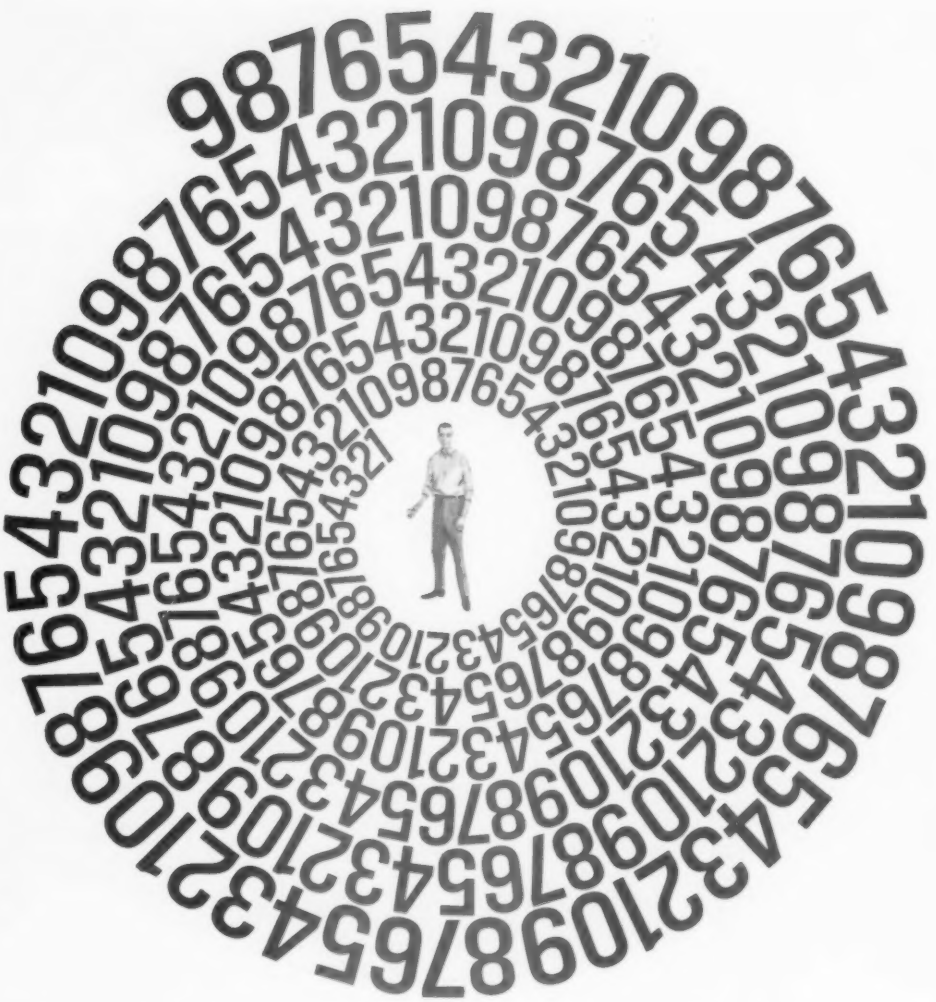
burners (4 per heater) has needed replacement.

Perfection Schwank *Gas* Infra-Red Heaters give J & L all the advantages of modern *gas* heat . . . high efficiency, precise control, speed, cleanliness, economy and dependability of supply. Gas can be the answer to your unusual or everyday heating problems.

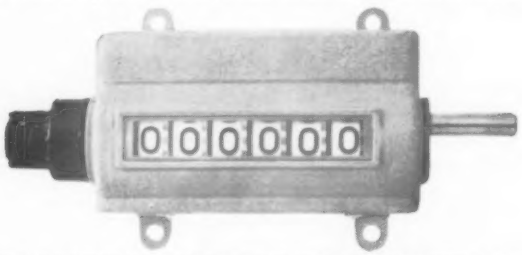
Heat better for less with Perfection Schwank *Gas* Infra-Red Heaters. For complete information, contact your local Gas Company or write to Perfection Division of Hupp Corporation, licensee of American Infra-Red Radiant Co., 1135 Ivanhoe Road, Cleveland 10, Ohio. *American Gas Association*

°Under Schwank U.S. Patents 2,775,294 and 2,870,830 and pending applications.

FOR HEATING GAS IS GOOD BUSINESS!



Now numbers big enough to see at 20 feet . . . on the Veeder-Root Visicounter! No squinting, no stretching with the new Visicounter. This counter, with larger than ordinary figures, provides easy read out for difficult-to-see locations. And, no matter how hard your machinery jiggles or punches, the Visicounter goes right on scoring because it's built to take it. Whether you're designing new machines or boosting efficiency of present equipment, you'll find that it pays to check into Visicounter. Write: Mechanical Section, Veeder-Root Incorporated, Hartford 2, Conn. **count on...Veeder-Root**



Visicounter is available in ratchet types, with speeds up to 500 counts per minute, or in geared types with up to 1,000 counts per minute. The new figures, larger and sharper, are another example of Veeder-Root design for maximum efficiency.

Six ways your company can cut materials handling costs with NVF Kennett Containers

Today you may be buying materials handling containers made of wood, metal, plastic, cardboard or canvas—at a price that looks like a real saving. But you may be paying *more* in terms of container life and performance. Check these six important cost-cutting features of NVF Kennett Containers made of tough Vulcanized Fibre, and write for complete facts:

Long Life. Kennetts are durable, take the slam-bang of plant operations for years. Replacement cost is nil.

Easier Handling. Kennetts are lightweight. Women handle them easily. Productivity increases.

Less Plant Noise. Kennetts reduce tension-building clatter. Contribute to more efficient plant operation.

Safety. Kennetts are snag-free. Won't chip, peel, splinter, rot or rust. Protect contents, hands, clothing.

Custom Design. Kennetts can be fitted to exact dimensions of your needs. Standard construction in any size or color.

Fire Protection. Kennetts are available in a special fire-resistant grade of fibre: check fire, reduce hazard.

■ Write now for *free*, full-line catalog, or check Sweet's Plant Engineering File 1h/Na for the NVF Sales Office near you. National Vulcanized Fibre Company, Dept. KK, Wilmington 99, Delaware.

NVF•

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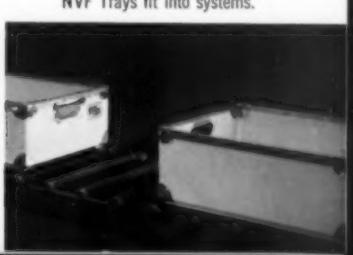
NVF Trays are easily handled.

Reusable Shippers protect instruments.

NVF Receptacles are rugged.

NVF Trays fit into systems.



COST REDUCTIONS ARE GUARANTEED...

Located in scheduling office or on production line, Dennison Dial-Set automatically adds variable information directly from production orders to pre-printed forms.

. . . when a Dennison Dial-Set System imprints your variable information!

Savings up to 50% are a matter of record when a customized Dennison Dial-Set System replaces any other method of adding variable information in short runs to pre-printed forms.

What information? Name it and you can have it! Job, order or style number. Quantity, material, size, color or code. Any combination of letters from A to Z and numerals from 0 to 9, specials if needed. All tailored to fit your pre-printed forms.

What pre-printed forms? All kinds! Box end, package and identification labels. System tags for production, piece-rate, inspection and warehouse control. Work, repair and pay tickets. Warranty cards. All tailored to your needs by Dennison for the fastest imprinting ever.

How fast? With Dial-Set, all copy changes are made with a twist of the wrist and visually checked in seconds. The operator just turns the indicator dial. No hand-setting of type. No make-ready. No fumbling for stamps or plates. No typing of short-lived masters or stencils. No inventory of plates or pre-printed supplies. Imprinting speeds up to 165 impressions a minute reduce operator time to a cost-cutting minimum. Moreover, complete counter control prevents costly "overs" and "unders". And, because there's no ink to smear, plates to wear or stencils to clog, you get clean, exact impressions every time.

What's the cost? Much lower than you realize! A Dennison Dial-Set Machine rents for only a few dollars a month. Variable information forms . . . tags, cards or labels as designed and pre-printed by Dennison . . . offer a unique combination of quality and economy. For a free, non-obligation dollar analysis of your present methods and a cost comparison with Dennison Dial-Set, contact your nearby Dennison office or write direct to Dennison Mfg. Co., Machine Systems Division, Dept. P101.

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first in silicones

Dow Corning

SILICONE NEWS

production and maintenance edition • No. 40

FOR FASTER MOLDING

Quick, clean, easy release — molds popping free from patterns every time — helps assure steady production, close tolerances, minimum machining. One way to get these "fast get-aways" is the use of a Dow Corning parting agent.

Proof is found in a production operation at the Ford Motor Company foundry. Here, shell molds for casting crankshafts are made on a high production, multi-station rotating machine. Failure of just one shell to separate from its pattern would quickly bring operations to a halt . . . result in waste, rejects and mounting labor and material costs. But not at Ford.

Their foundry engineers prescribed the right preventive medicine years ago when they settled on a silicone shell mold parting agent as a coating for patterns. A light spray coating of the dilute silicone emulsion is all that's needed for good release and excellent surface finish.

In another shell mold operation, Ford dips multi-unit engine valve patterns in the emulsion. Even with such deep draws as are encountered in small diameter valve stems, release is clean and easy . . . production stays on schedule.

If lack of "fast get-away" is hampering your production, just put Dow Corning Silicones on the job. You'll get clean release with less build-up on patterns. Patterns stay clean for many cycles; you may even find fewer are needed. Write or phone the Dow Corning office nearest you for full data. *No. 647*

Rewinding Is Rewarding

How much wood can a log chipper chip? A lot depends on the motor driving it. Here's how one company upgraded its paper-pulp operation and prolonged chipping machine motor life.

At the West Point, Virginia plant of The Chesapeake Corporation of Virginia, a mechancial conveyor discharges logs into two chippers. One machine is powered by a specially built 800-hp motor . . . the other by a 600-hp, 2300-volt, wound-rotor motor operating at 570 rpm. To handle its quota of 600 cords per day, the 600-hp motor must deliver nearly 800 hp about half the time; must meet momentary peak loads of 1200 hp.

After two years on the job, the 600-hp motor's Class B winding failed. The motor was out of service just long enough to be rewound with Dow Corning silicone insulation by Electrical Equipment Company, of Richmond. Silicone insulation was specified because its greater thermal stability means increased overload capability — longer, trouble-free service life.

Since rewinding, this motor has been operating under the same severe conditions for over six years — more than three times longer than with its Class B insulation — and the silicone windings are still "in excellent condition".

Such a "more work, less down-time" record is routine for motors rewound with Dow Corning Silicones. Just ask the Dow Corning Authorized Service Shop nearest you or circle . . . . *No. 648*

NEW PROCESS AID

When processing sticky materials and products such as raw rubber, candy or resin-bonded laminates, "stickers" can cause lost time and extra cost. But they don't when you use interleaving or process papers coated with the new Syl-off® silicone coating.

Standard containers available with Syl-off coated liners or inner surfaces include bags, fiber drums, unit containers, cores and cartons. Pan liners and wrappers coated with food-grade Syl-off are also available. In every case, these silicone coated papers aid quick and *(Cont. pg. 2)*

CABLE THAT WON'T QUIT

Surround a cable with red hot steel, searing grease and hot scale. Add cleaning salt and plenty of moisture. A diet like this would kill most cable. This is the story of one that thrived on it . . . and kept production rolling.

At America's largest plate rolling mill — part of the Lukens Steel Company — a 200-hp motor operates around the clock, seven days a week, feeding steel into the mill. And around the clock, seven days a week, heat, grease, salt and moisture work on the exposed feeder cable.

No wonder it was necessary to shut down this mill at least once a year to service the cable . . . that is, until 1955 when cable insulated with Silastic®, the Dow Corning silicone rubber, was installed. Since then, there hasn't been a moment's downtime (or lost production) due to cable failure . . . because there just hasn't been any cable failure!

What are your particular needs for an insulation that increases cable life in almost any application and performs reliably despite rough operating environments? Leading wire and cable manufacturers can help meet those needs with power cable, control cable, hookup wire, fixture wire and building wire, all insulated with Silastic . . . insulation that will whittle *your* maintenance bill and keep production in high gear. Write for a list of these suppliers. *No. 649*

TYPICAL PROPERTIES OF SILASTIC FOR WIRE

Temperature range, °F	—130 to 500
Insulation resistance, megohms/1000 ft.	1000 to 3000
Electric strength, volts/mil	300 to 500
Dielectric constant, 10^2 cycles per second, nominal	3.2

new literature and technical data on silicones

Ready-To-Use — Now a single component room temperature vulcanizing silicone rubber has been developed by Dow Corning. It is available for immediate application . . . for patching, sealing, and other maintenance jobs. Reacting to moisture in the air, Silastic RTV 731 cures at room temperature to a solid rubbery form. This data sheet gives details . . . . . *No. 651*

Reduce Insulator Maintenance — A new data sheet gives the facts on using Dow Corning 5 Compound for protecting electrical bushings and insulators. It explains how this silicone material prevents flashovers, eliminates electrical leakage in contaminated areas. Ease of cleaning, methods of application, quantities required, as well as typical properties are detailed in this illustrated data sheet . . . . . *No. 652*

The Story on the Strong Bond Now Possible— Silastic 140 Adhesive is the new ready-to-use silicone product that effectively bonds silicone rubber to virtually any other material — glass and glass cloth, aluminum copper and steel, plastics, and silicone laminates or rubber. Neither heat nor pressure is required to form a firm, heat-stable bond that's also resistant to water and oils. For information on bond strength of Silastic 140 Adhesive or how to use it. . *No. 653*

Better Brick Buildings — This is a 14-minute, full color documentary describing Silaneal, the only brick treating material proved safe in SCPRF-prescribed wall tests and by 3-years experience in the field. You can witness methods of application and actual buildings protected by invisible Silaneal that reduces ground stains, minimizes efflorescence, makes lay up easier and faster, and keeps walls clean and beautiful longer. Arrange for a free showing by writing for *No. 654*

A B C's of Defoaming — the literal ABC's to fast antifoam action are compiled for you in a new comprehensive brochure on Dow Corning silicone foam suppressors. This 8-page booklet gets down to cases showing how just ¾ ounce of silicone antifoam can stop foam in a 5,000 gallon metalworking pickling solution. These versatile antifoam agents are actually reducing maintenance time . . . processing time . . . costs . . . while increasing production capacity . . . efficiency . . . economy in almost every industry. This new manual on foam control discusses the processing of chemicals, ceramics, petroleum, asphalt, paper, textiles, food, drugs, and the metalworking industries. . . *No. 655*

SYL-OFF *(Continued)*

easy removal of sticky products . . . help keep production moving . . . hold product waste to a minimum.

Syl-off coatings have natural nonoily lubricity and water repellency; won't migrate, contaminate, transfer or alter paper characteristics.

Whether you process, ship or receive sticky materials, Syl-off coated papers are worth looking into. Write for list of Approved Sources today. *No. 650*

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IT'S BOUND TO BE BETTER WITH USS STEEL STRAPPING TOOLS

New air-powered tool speeds strapping of boxcar parts at Pullman-Standard

There is no more burdensome hand-operated strapping done at Pullman-Standard division of Pullman Incorporated. They now automatically flat strap steel boxcar flooring and steel compartmentizer doors with the new USS pneumatic Model 7300 stretcher. A slight twist of the control knob on this heavy-duty machine automatically stretches strapping to a pre-set tension. Result: A tighter, more compact bundle with no shifting or damage in transit.

The portable Model 7300 is built for long service, little upkeep. It's lightweight, simple to operate. With the Model 7300, you can have a uniform strapped package every time. There's no repackaging because of loose straps. This automatic machine can unitize and palletize any size shipment faster and better than any previous method.

Learn how the Model 7300 can upgrade your strapping operation. For more information, send the coupon.

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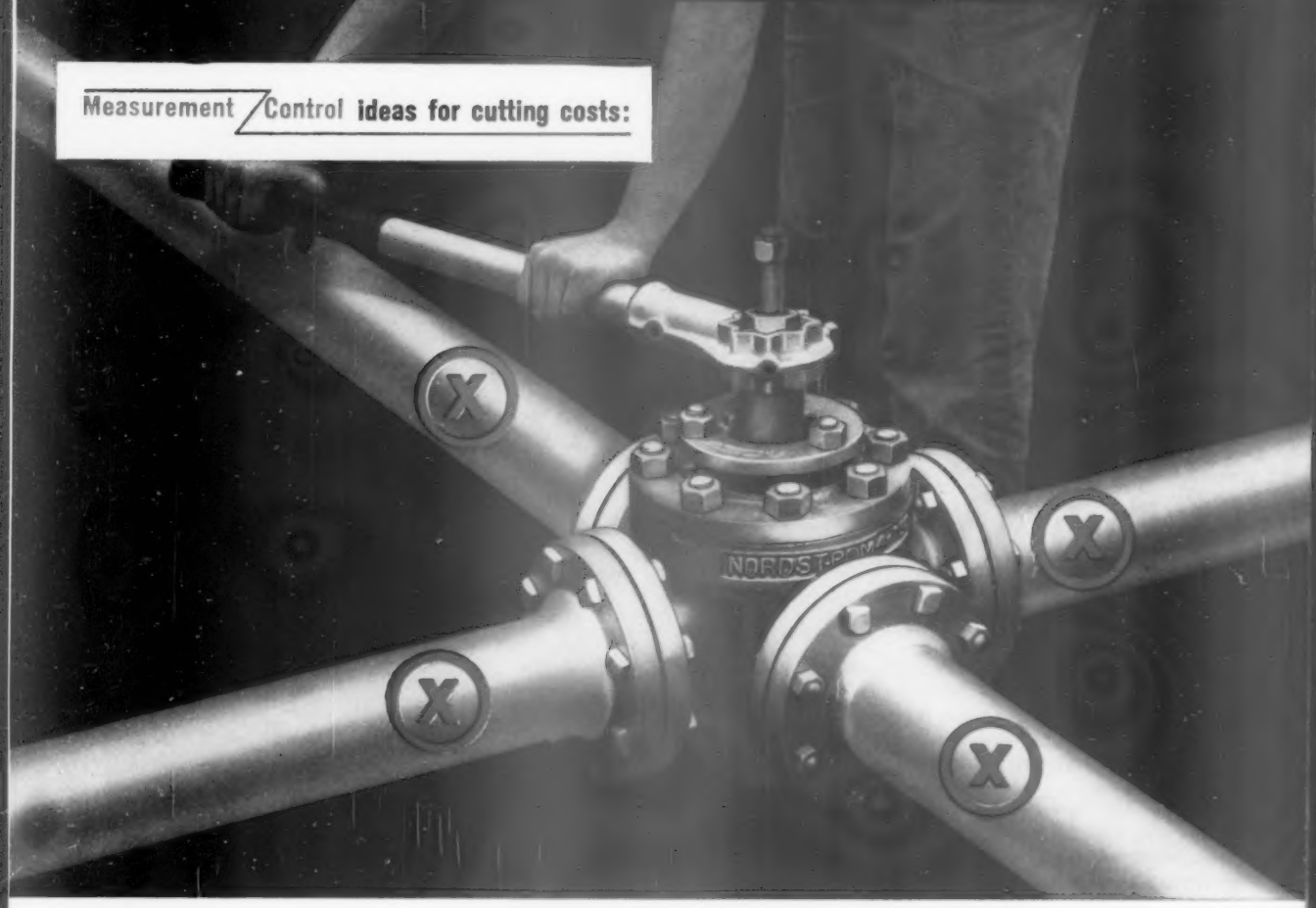

(X) MARKS THE SPOTS
where 4 valves are replaced by 1...

. . . And that one valve is a Rockwell-Nordstrom Multiport lubricated plug valve. Above, it is controlling flow in *four* directions—a multiple job only this type of valve can do.

This could mean big savings in your plant, plus more efficient traffic control of everything you flow through pipe. For instance: A large sugar refinery had trouble efficiently routing slurry to process units. A Rockwell field engineer recommended Multiport valves, since *one* Multiport does the work of *three* or *four* ordinary valves. With fewer valves and simplified piping and fittings, the new installation quickly paid for itself by eliminating costly flow control errors and improving quality. And since Rockwell-Nordstrom is the most *complete* line of lubricated plug valves, the Rockwell field engineer was able to make a number of other valve suggestions for improving flow control, preventing waste, and reducing valve maintenance.

There are literally hundreds of ways Rockwell field engineers are helping manufacturing and processing plants save time, money, and materials through better measurement and control methods. The experience of the world's largest manufacturer of valves, meters, regulators, and other measurement and control products, can pay off for you, too. Wherever gases or liquids flow through pipe in your plant, there is a real opportunity for savings. It will cost you nothing to get the facts. Simply send the coupon.

ROCKWELL

The leading single source for Measurement / Control products and ideas

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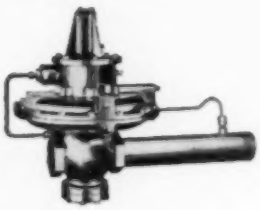
"IN-PLANT" METERING:

LIQUIDS AND GASES

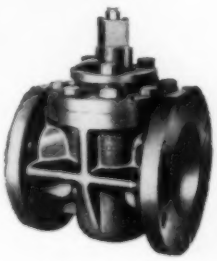
Rockwell gas and liquid meters, properly applied, can improve quality control, sharpen cost control, and prevent waste in almost every plant department. A Rockwell Field Engineer can help you find *where* meters will cut costs . . . and Rockwell has a complete line of meters to measure practically anything that will flow through pipe.

CONTROLLING PIPED MATERIAL:

LIQUIDS AND GASES



More efficient control of all the material flowing through pipes in your plant is a positive step in cutting costs. There are new applications and new ideas for using gas pressure regulators and valves that will stop wasteful, inefficient, and dangerous handling of fuels, production fluids, and products. A Rockwell Field Engineer can show you *where* and *how*.



HOW MUCH COULD YOU SAVE?

There is hardly a plant anywhere—including yours—where the right application of the right measurement and control methods and equipment won't produce savings many times the modest cost involved. Certainly it's worth investigating—especially since it will cost you nothing to find out. Simply mail the coupon now.

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Company_____

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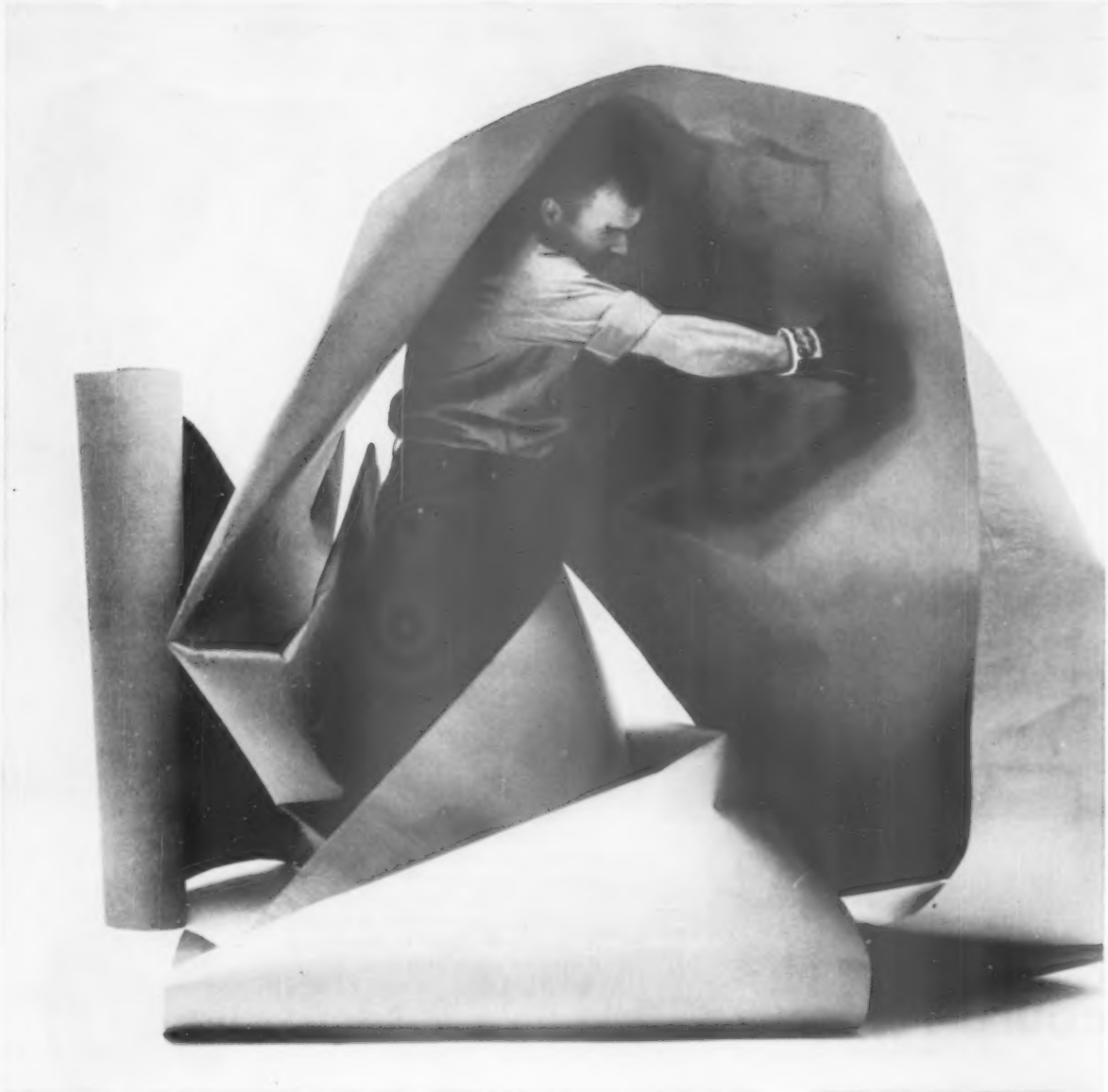

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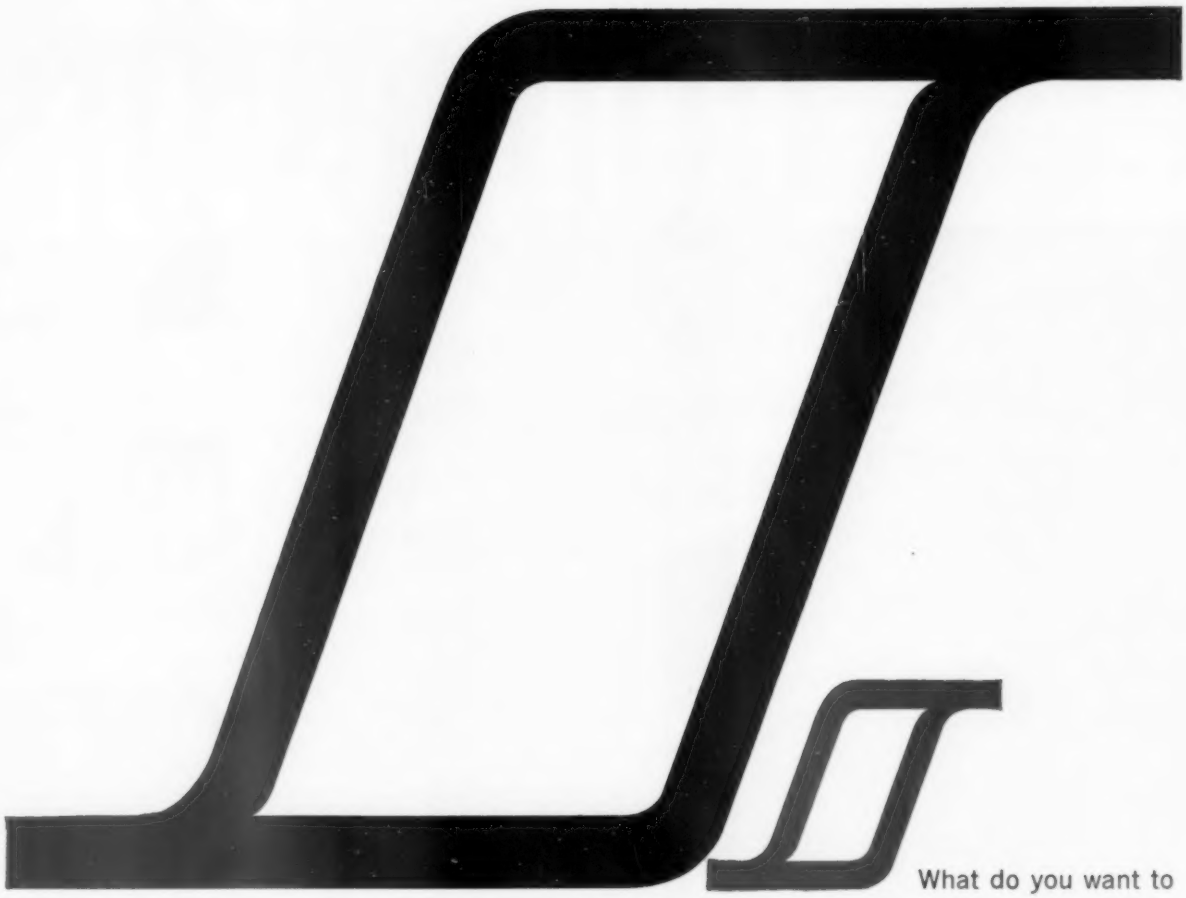
In Canada: Murray-Brantford Ltd., in principal cities

For more facts Circle 421 on Reader Service Card



What do you want to control? The flow and measure of 20,000 amperes in an aluminum ore processing plant? (A large static control system will provide pinpoint control—and eliminate the need for direct connections between meter panel and bus bar.) Or do you want to supply exact change in an automatic bill-changer? (A small static control system will do this—and detect counterfeits to boot!) Large system or small, static control can be the answer. ■ We show large and small hysteresis loops to define these systems as *magnetic* static control. Such systems have no moving parts (static), and under normal operating conditions will never burn out or wear out. There is virtually no maintenance needed, almost no heat loss, and fewer components than in conventional systems. Static control systems are used on automobile assembly lines, for annunciator systems, and for controlling the speed of 1/20-hp motors. If you, too, would like to learn what your operating statistics and costs could be by using magnetic static control, write to Magnetics Inc., Dept. **F-87,** Butler, Pa.

INDUSTRIAL CONTROL EQUIPMENT

MAGNETICS inc.

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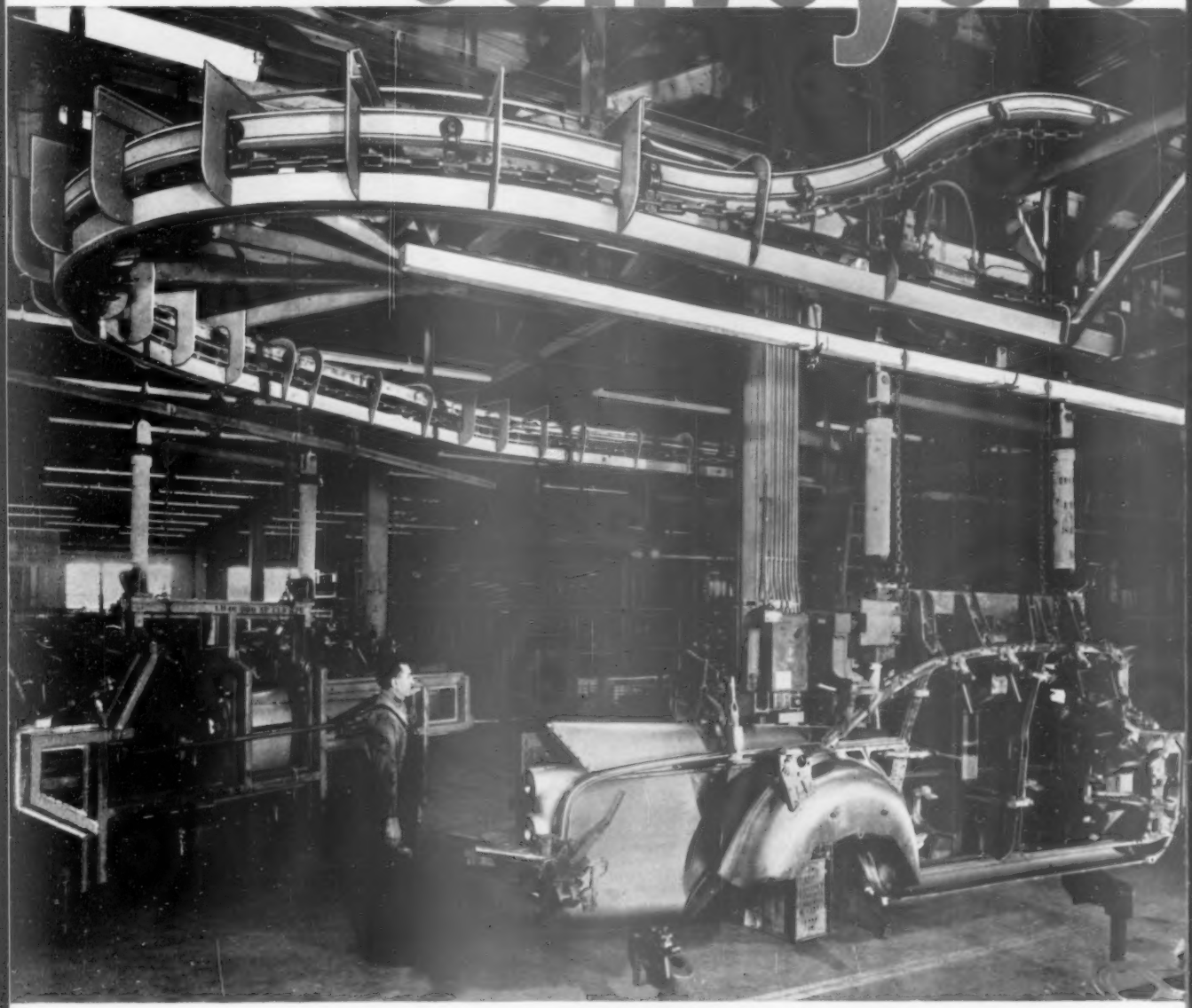
LINK-BELT conveyors



POWER-AND-FREE TROLLEY CONVEYORS make straightline production possible even where materials require an extended period of time for processing. Load carrying trolley can be disengaged from power conveyor and propelled by hand or gravity along free track. Link-Belt can provide Power-and-free conveyors to carry items of all sizes and shapes . . . to travel any path. System shown here is handling auto frames.

The last word in value from the first name in conveyors

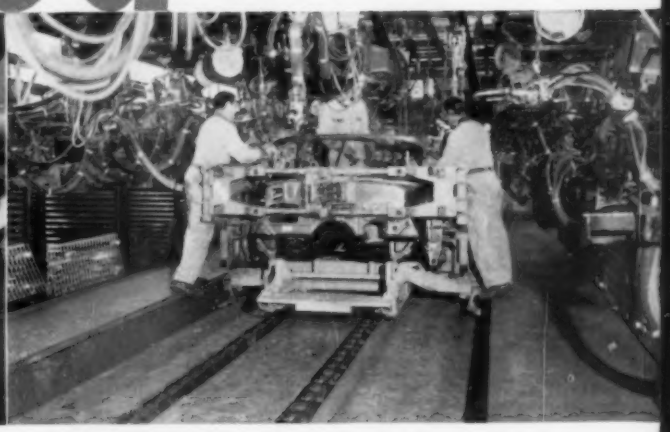
"Conveyors unlimited" means just that! Link-Belt offers *industry's most complete line of conveyors* . . . all built to quality standards that are second to none in the field of materials handling. And because Link-Belt makes such a wide variety of types and sizes, you can be sure of unbiased recommendations . . . can count on the operating economies and efficiencies that only perfectly job-matched equipment provides.

Also important, Link-Belt can provide *complete* handling systems . . . patterned exactly to your requirements with a background of more than 80 years of conveyor specialization. Our engineers are familiar with the particular handling needs of every industry. It's more than likely they have met—and solved—many problems similar to yours. We will design, equip and erect your entire installation . . . and accept full responsibility for its successful operation.

For full information—on single components or complete systems—large or small—contact your nearest Link-Belt office. Catalogs covering all conveyors are available on request.

unlimited

The line that means savings, whether handling parts or bulk materials, finished products or units

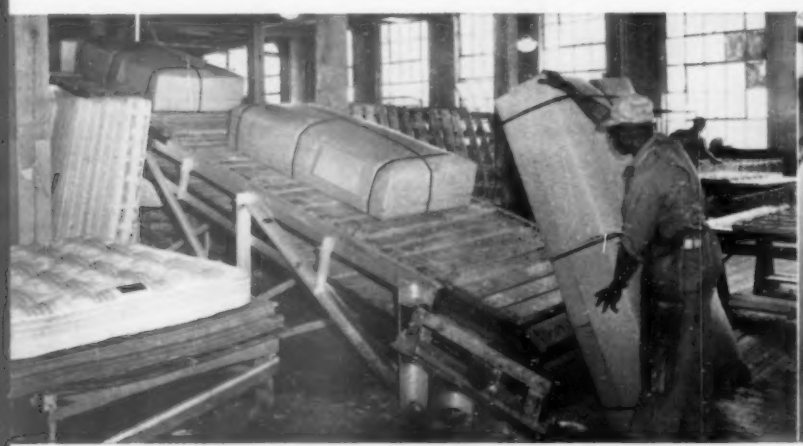


CARRIER CHAIN CONVEYORS—Link-Belt has chains and attachments for conveyors of this type to handle objects in a wide range of shapes, sizes and weights. Attachments may be assembled at intervals or to form a continuous carrying surface. Here, newsprint rolls ride on a continuous line of saddle-top pallets.

PLAIN CHAIN CONVEYORS—Carry the load directly on chain or drag bulk materials along a trough. Link-Belt builds these versatile conveyors with single or multiple strands . . . for light to extremely heavy-duty applications, for routes a few feet to hundreds of feet long. This conveyor is moving auto bodies through assembly.

SLAT CONVEYORS—Convey over horizontal or inclined paths, or a combination of both. Also ideal for use as traveling work tables. They are built with carrying members of wood or steel . . . slats attached to a single or double strand of steel or malleable iron chain, depending on application. Here, a Link-Belt slat conveyor simplifies handling of bulky mattresses.

FLAT BELT CONVEYORS—Operate up or down slopes as well as horizontally. The carrying run may slide on a flat deck or trough, or operate over closely spaced idlers. They provide a smooth path of travel and gentle handling for objects of moderate weight.



LINK-BELT

CONVEYING AND ELEVATING EQUIPMENT

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses and District Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs; Switzerland, Geneva. Representatives Throughout the World. 15,615

Keeping production on the move in every industry

- Apron conveyors
- Arm and tray elevators
- Belt conveyors
- Bucket elevators
- Bucket elevators-conveyors
- Bulk-Flo
- Car-type conveyors
- Chain conveyors
- Circular carrier conveyors
- Drag conveyors
- Flight conveyors
- Flite-Flo conveyors
- Oscillating conveyors
- Power-and-free conveyors
- Pusher chain conveyors
- Scraper conveyors
- Screw conveyors
- Sidekar-Karrier conveyors
- Skip hoists
- Slat conveyors
- Trolley conveyors
- Trukveyors

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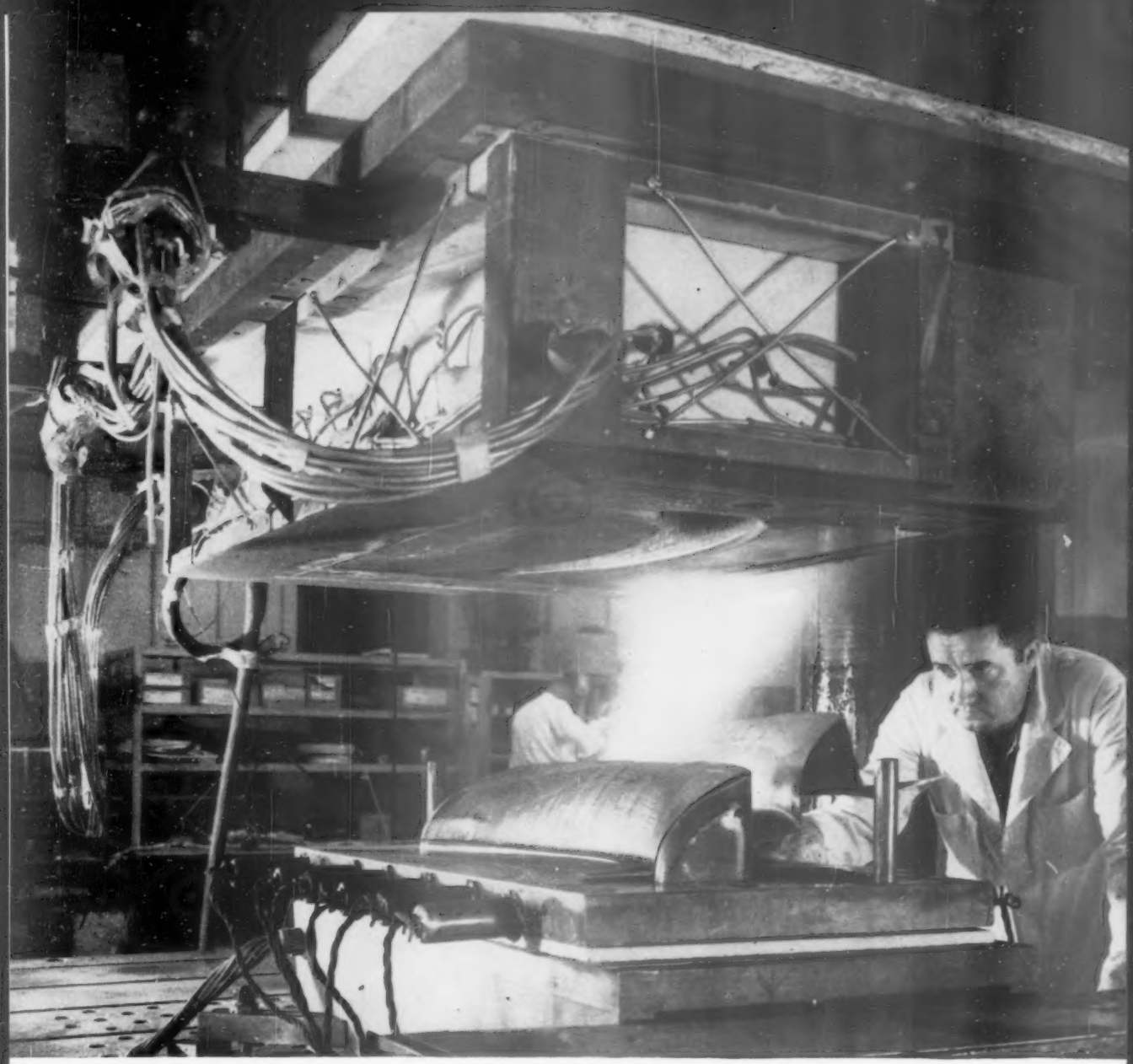
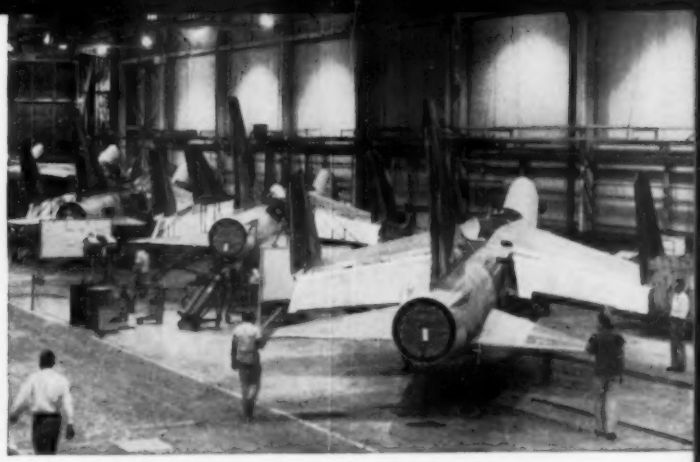


Gulf Harmony® oil has the extra stability press operation at Chance Vought...

Chance Vought Corporation, Dallas, Texas, developed a unique production technique to speed production of jet fighters. It's a 1000-ton press with electrically heated dies that permits the forming and stress-relieving of a titanium part in one operation.

However, this advanced technique created several problems. One, according to Doy Stanley, General Foreman, Facilities, was the heavier burden placed on operating parts of the press. When forming and stress-relieving were combined in one operation, high temperatures and pressures had to be applied for long periods of time. Under these conditions, maintenance of the press is very important. According to Mr. Stanley, "We've always stressed efficiency in our operation. And downtime is, as you might say, doubly inefficient."

Proper lubrication of hydraulic mechanisms and other press parts subjected to elevated temperatures and pressures is a must to keep production right on schedule. Says Mr. Stanley: "We have never had any



F8U Navy fighters near the end of the assembly line. Aircraft's leading edges use titanium part that has been formed and stress-relieved in one operation.

Doy Stanley, left, discusses hydraulic oil applications with Grover Garrison, Gulf Sales Engineer. Hamilton Press shown in background is one of various presses at Chance Vought that use Gulf Harmony oil.

On this 1000-ton press, simultaneous forming and stress relieving of titanium takes place at 1000 deg. F. Quality Gulf Harmony oil protects the vital hydraulic system.

needed for high temperature
GULF MAKES THINGS RUN BETTER!

downtime, or any trouble at all that can be attributed to lubrication. This excellent record is due mainly to the fact we use a high quality hydraulic oil that won't break down under heat."

That "high quality hydraulic oil" Mr. Stanley refers to is Gulf Harmony. It not only withstands heat, but resists oxidation, which improves service life and prevents sludge formation. Also, a corrosion inhibitor guards against rust, and an anti-foaming additive assures a smooth transfer of power.

If you have problems involving hydraulic fluids, or any petroleum product application, may we have the opportunity to prove to you that Gulf makes things run better! Call your nearest Gulf office, or write us for additional information.

GULF OIL CORPORATION
Dept. DM, Gulf Building
Houston 2, Texas

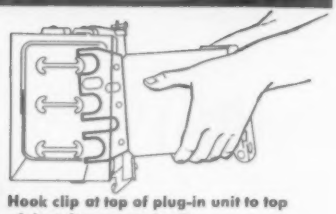
GULF

For more facts Circle 424 on Reader Service Card

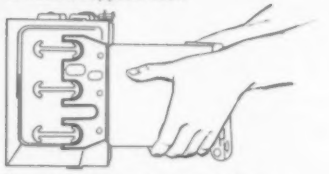
Why SQUARE D ALUMINUM PLUG-IN DUCT?

Because you want a duct that's rugged – built to thrive on heavy duty – *plus*

PLUG-IN UNITS GIVE YOU EXCLUSIVE *hook-swing* MOUNTING



Hook clip at top of plug-in unit to top of duct. It supports itself



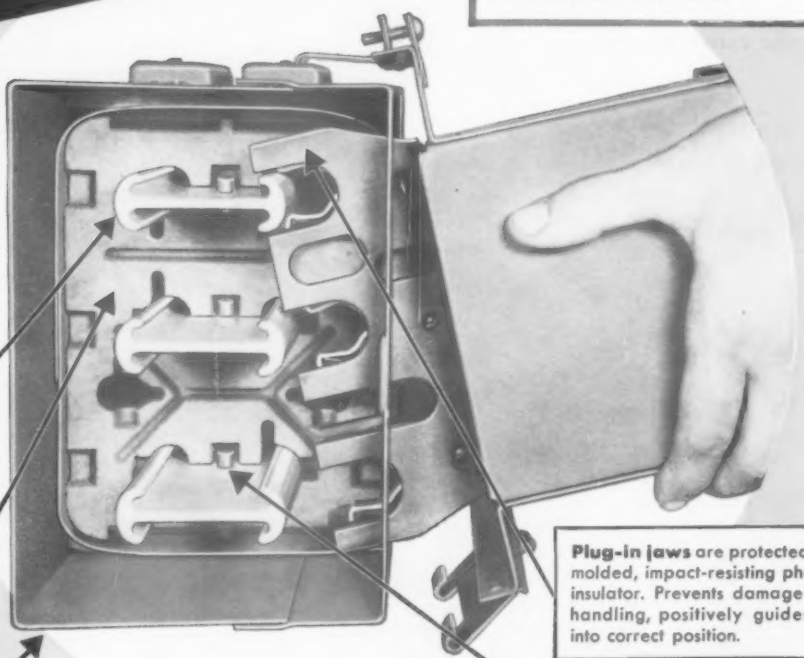
Then, just swing plug-in unit down until jaws engage bus bars

Hanger mounting (*not shown*) makes installation easy. A universal hanger permits mounting in *any* position. Just suspend and level top portion of hanger, then clip on lower portion. U.L. approved for 10-foot spacing.

I-beam construction of bus bars—a Square D exclusive—provides four times the strength of conventional bus bars. Bars are zinc, copper and silver-plated full length.

Full width bus support provides greater strength on short circuits, freedom from vibration. Also acts as fire stop where duct passes through walls and floors.

Square D duct is totally enclosed for maximum safety—no danger of accidental shorts. Prevents overheating from dust accumulation.



Plug-in jaws are protected by a molded, impact-resisting phenolic insulator. Prevents damage from handling, positively guides unit into correct position.

Steel pins in each bus bar prevent bars from shifting and support them on vertical riser installations.

With other plug-in duct, it's no easy job to mount the plug-in units. In fact, it takes a lot of real pushing which is neither safe nor easy when you're working on a ladder. With Square D's exclusive *hook-swing* mounting, you just hook the plug-in unit to the top of the duct. Then, simply swing it down and in until the jaws have engaged the bus bars. No awkward pushing required—no unnecessary chances to take. Compare Square D's rugged, heavy-duty construction with any other. It costs no more—why settle for less?

Write for Bulletin SD-110. It gives the facts on Square D aluminum plug-in duct. Address Square D Company, Mercer Road, Lexington, Kentucky

SQUARE D COMPANY

wherever electricity is distributed and controlled

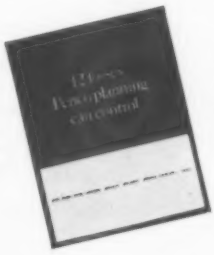
How many of these 12 losses can you cut with Penco-Planned shelving & lockers?

- ☐ Product Damage
- ☐ Excessive Handling Costs
- ☐ Waste Space
- ☐ Slow Order-filling
- ☐ Poor Inventory Control
- ☐ Insurance Costs
- ☐ Pilfering
- ☐ Accidents
- ☐ Production Bottlenecks
- ☐ Shipping Bottlenecks
- ☐ Plant Cleaning Costs
- ☐ Low Employee Morale

If your company is considering new shelving and lockers, look into Penco Planning before you buy. Your Penco representative can show you how Penco units can be used to control *up to 12 major drains on efficiency and profitability* . . . if your operations and requirements are studied in advance. Re-check the list above! The secret is not how many units you buy, but how well units are integrated into your operations as functional systems. Check the Penco installations shown here. Then get more details in our free booklet "12 Losses Penco Planning Can Control". It's filled with slants on how to make storage facilities pay off. Finally, before you buy any lockers or shelving, call your nearby Penco dealer for advice and for fast, efficient service.

One look tells you that these Penco-Planned lockers step up employee morale, cut housekeeping costs.

New Penco T-Line boltless shelving above covers 48,000 sq. ft. . . . speeds handling of 15,000 production items. It simplifies inventory of parts in process, and permits fast changes of layout. No tools are required.



SEND FOR THIS FREE BOOKLET TODAY

ALAN WOOD STEEL COMPANY
PENCO DIVISION 424 Brower Ave., Oaks, Pennsylvania

Please send free booklet, "12 Losses Penco Planning Can Control." (No obligation, of course.)

Name_____ Title_____

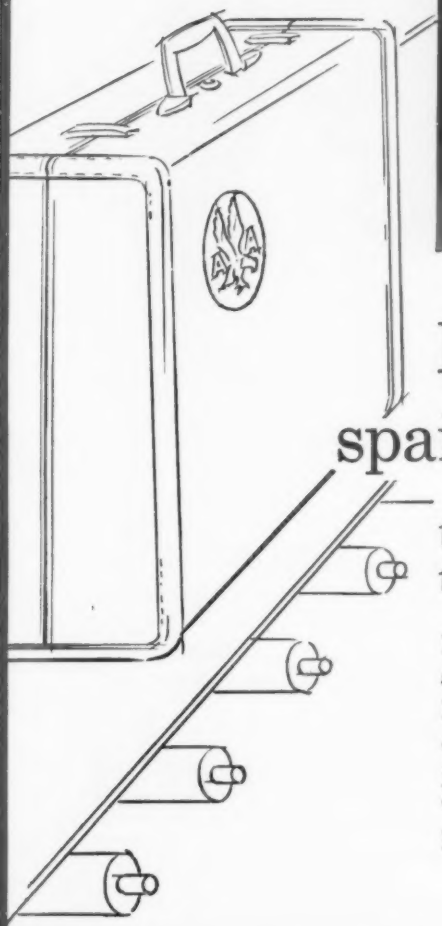
Company_____

Address_____

City_____ Zone____ State_____

Please send also: ☐ General Shelving Catalog ☐ General Locker Catalog

One Logan belt conveyor runs behind the American Airlines ticket desks, full length of the new terminal's 200-ft. main lobby. Ticket agents weigh and tag baggage and place it on this continuously-running line. Stainless steel kick plates give the conveyor an attractive built-in appearance and prevent accidents.



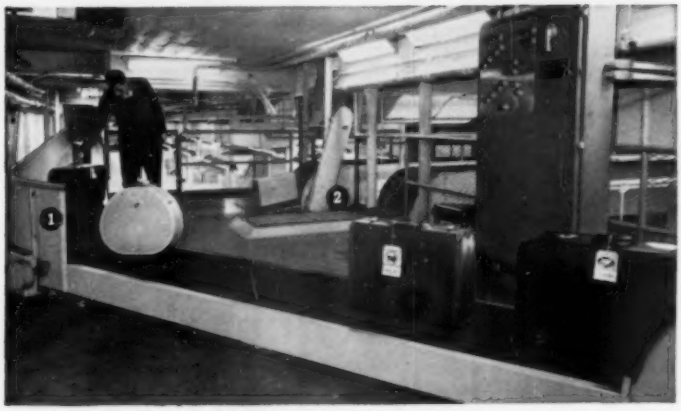
Logan *Plant Dynamation* sparks air baggage to jet pace

through the new American Airlines terminal at Idlewild

Like modern production machines, modern jet passenger planes call for new approaches to material handling. Photos on these pages show how a 700-ft. Logan *Plant Dynamation* conveyor system helps keep the baggage of 2800 daily passengers in pace with fast schedules. This feature of American Airlines' jet terminal at New York International Airport is part of the hemisphere-wide "Baggage Expediter System" for 707 Jet Flagships. The Logan conveyors have a peak capacity of 1500 parcels per hour—over 18 tons of baggage.

One chute conveyor and two inclined belt conveyors lower bags to ground level points where final sorting takes place. Bags actually enter jet planes in the molded fiber "pods" seen on the right. The movable Logan conveyor in the background quickly returns to the junction platform any bags requiring re-routing. Total time from lobby to flight pod: about five minutes.

Much outbound baggage arrives by bus and limousine. These parcels are lowered by a combination chute and belt conveyor line, direct from the terminal's front ramp to the baggage sorting junction.



One level below the main lobby, all baggage enters a suspended junction platform area where it is sorted by flight and dispatched to proper loading areas. In the photo above the conveyor from the lobby is numbered 1, the line from front ramp numbered 2. The Logan control panel at right monitors and controls the entire conveyor system.

Why the leaders of so many industries call in "The Man From Logan"

Whether your problem is more like pacing suitcases through a terminal, appliances through assembly, or cookies through a bakery, the Logan field engineer takes hold like a specialist in *your* type of conveyors. There is a reason:

The Logan technique of Plant Dynamation cuts straight to the heart of any process and the individual needs of any plant. The Logan engineer helps you analyze your plant's *basic work-power patterns* . . . then moves step by step to design the one right conveyor system dictated by these patterns.

Over the half-century in which assembly-line production itself has grown up, Logan engineers have developed and proved the Plant Dynamation concept through thousands of custom installations, in a very wide range of fields. All this experience is focused on your job. On an average, "The Man From Logan" stationed near you has fourteen years of Logan training and experience.

One of the most comprehensive lines of conveyor equipment permits the Logan engineer to specify the one right system for you in every detail. Both as supplier and designer he commands five distinct modes of power and control. Every "Man From Logan" has made original contributions to modern automation.

"The Man From Logan" in your area is quickly available. He works with your engineers through design and installation to smooth operation. It is important to consult him early. Write or phone today for a conference on the *dynamation* of your plant.

Logan Conveyors

LOGAN CO., 510 CABEL ST., LOUISVILLE 6, KY.

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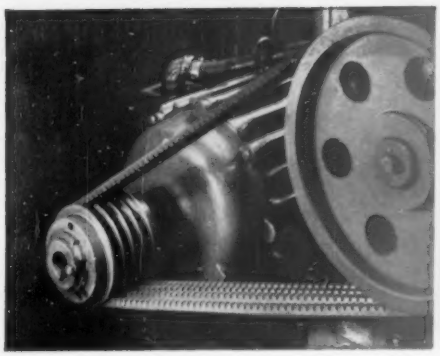
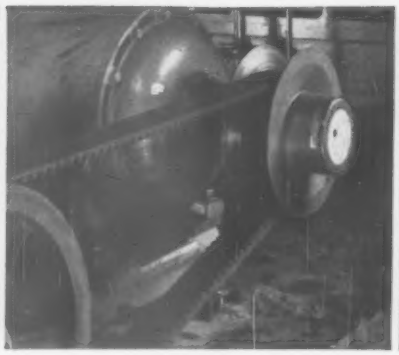

Wood's specialization provides the right drive to solve your belted transmission problems . . .

. . . particularly if your problems involve horsepower, high, low or variable speeds, drive efficiency, space, economy or availability.

This is because Wood's people are specialists in the production, selection and application of *all* basic types of belted drives.

We are able to provide the *right* drive for a specific application because we manufacture all of the basic types. So, drive problems can be solved by Wood's fast and economically.

To the breadth of Wood's belted power transmission line, add depth of engineering and manufacturing experience (104 years, to be specific). This depth of experience is another element of specialization that enables Wood's to offer not only unique product advantages, but consistently high performance as well.

This is Wood's stock in trade . . . supplying the *right* answers to belted power transmission problems from a broad line of Ultra-V Drives . . . Variable Speed Drives (Motion and Stationary Control) . . . Timing Belt Drives . . . Flat Belt Drives.

Send for your copy of BULLETIN 23103.

Woods®

T. B. WOOD'S SONS COMPANY

CHAMBERSBURG, PENNSYLVANIA

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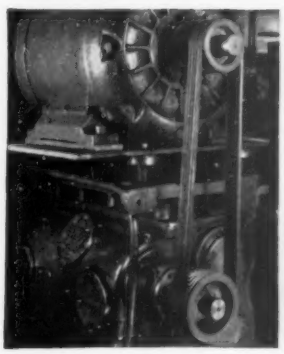
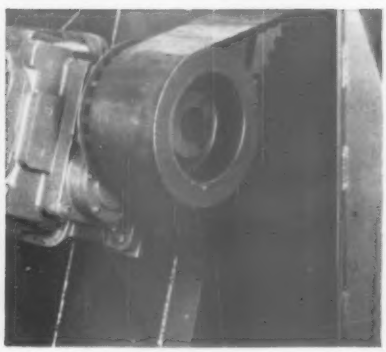
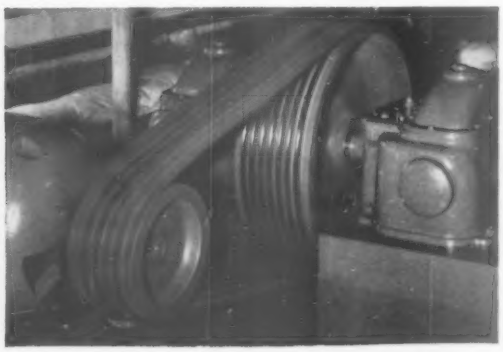




For more facts Circle 428 on Reader Service Card

Molded Rubber Diaphragm
Diaphragm Plate
Upper Spring Plate
Spring Assembly
Exploded view shows simplicity of operator assembly of Johnson Three-way Valves.

JOHNSON three-way mixing and by-pass valves

Simplified Design Provides Superior Performance, Cuts Upkeep Time In Half!

Johnson Three-way Mixing Valves and Three-way By-pass Valves are designed for "in the line" servicing. Discs and seat rings can be replaced *without* removing the valve body from the line. Result: maintenance costs are reduced more than half; service is restored far faster than with ordinary valves.

Other quality design features in Johnson Three-way Valves:

- Designed to permit straightaway piping hookup for faster, easier, neater installations.
- No slamming or water hammer — discs seat against the flow.
- No leakage — positive seating.
- Modulating plugs — for uniform flow, greater accuracy.
- High Lift — for precise proportioning over wider range.
- Proportional or two-position action.
- Sizes — 2½ to 6 inches.
- Pressures — 125 and 250 psi standard construction.

For details about Johnson Three-way Mixing Valves, write for Bulletins V-214 and V-215. For By-pass Valves, write for Bulletins V-210 and V-211. Johnson Service Company, Milwaukee 1, Wisconsin. 105 Direct Branch Offices.

JOHNSON CONTROL

PNEUMATIC SYSTEMS

DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885

New from Cleco

125 DIE GRINDER

Especially designed as a heavy duty die grinder for use with 3/8" shank carbide burs

**Available with button, lever and quick-as-a-wink throttle.*

The Cleco 125 (23,000 RPM) Die Grinder is a *new* development in metal removing, using heavy duty carbide burs and mounted points. It features what you have asked for in heavy duty die grinding—lighter weight, greater horsepower, more speed, no vibration.

Excellent for hand routing operations and fast metal removal with 3/8" or 1/4" shank carbide burs, the Cleco 125 Die Grinder extends the use of carbide burs into new fields.

Standard on all models is a metering valve that allows the operator to reduce the RPM for non-ferrous applications, such as cleaning aluminum castings. The metering features of the 125 Die Grinder coupled with high motor horsepower make it adaptable to ferrous and non-ferrous work.

For complete information on the Cleco heavy duty 125 Die Grinder, call or write—

CLECO AIR TOOLS

"quality tools engineered for industrial progress"

A Division of Reed Roller Bit Company P. O. Box 2541, Houston 1, Texas, U.S.A.

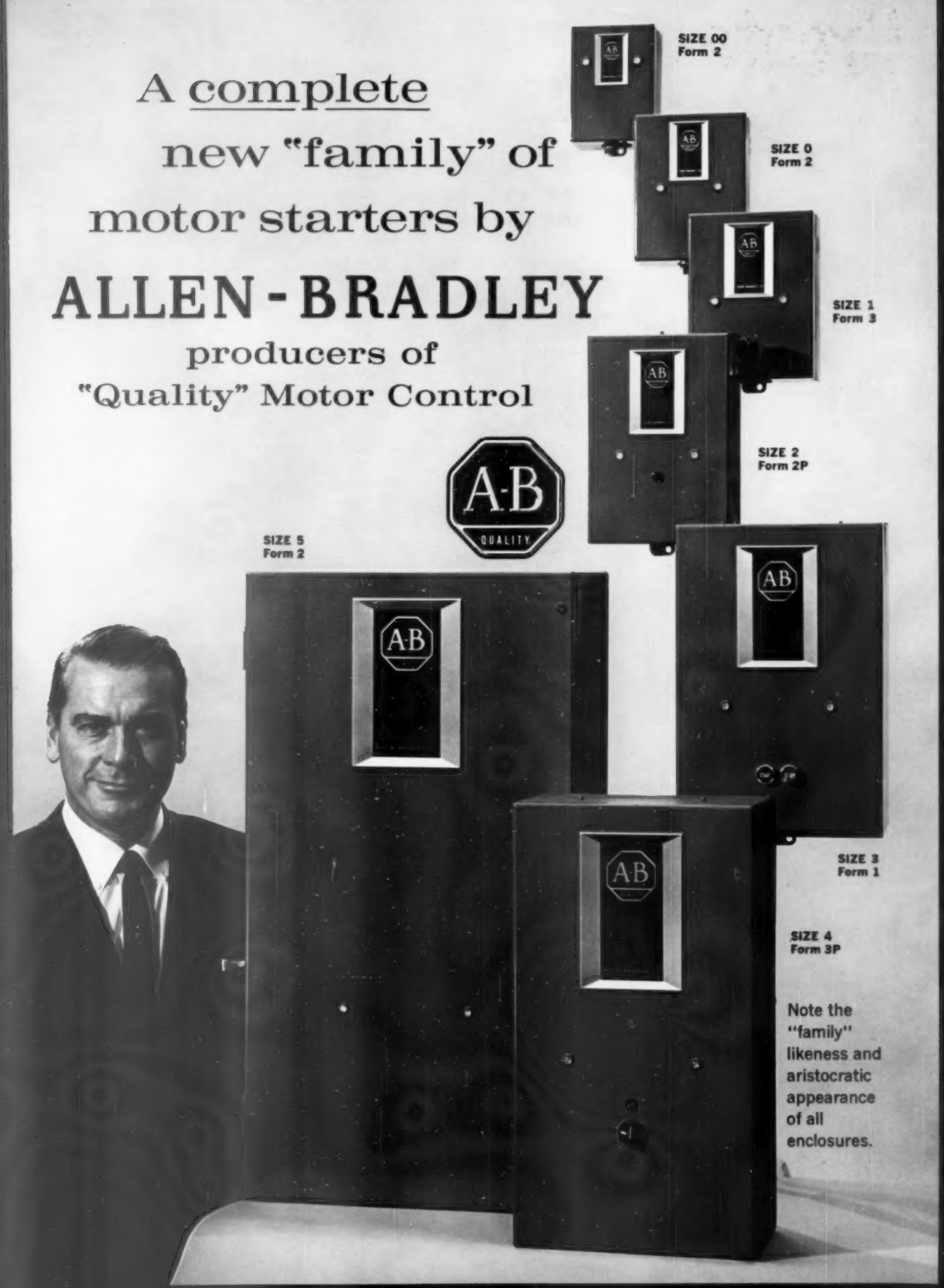
IN CANADA: Cleco Pneumatic Tool Company of Canada, Ltd., 927 Millwood Road, Leaside (Toronto) Canada

For more facts Circle 430 on Reader Service Card **Circle 431 on Reader Service Card for items on next page**

A complete new "family" of motor starters by

ALLEN-BRADLEY

producers of
"Quality" Motor Control



Greatest advance in motor

PLUS VALUES OF THESE NEW STARTERS

- smaller size
- greater interrupting capacity
- even more millions of trouble free operations
- more wiring room
- elegant styling
- A-B "quality" throughout

Thirty years of experience have gone into the design of this new Allen-Bradley line of motor starters. While retaining the principle of the simple solenoid design—with only ONE moving part—everything about these Bulletin 709 starters is **new**.

They're small—especially in the higher ratings. Yet, size for size, all tests have proved that they will outlast any starter now on the market—many times.

The **new**, patented, high-efficiency magnet—remarkably powerful for its weight and size—is cushioned to reduce shock and wear. The **new** coil is encapsulated for mechanical protection, and cannot be damaged by any corrosive atmosphere in which it may be used. The **new** precision hot molded arc hood confines the arc and increases the interrupting capacity.

ALLEN-BRADLEY

Bulletin 709

Quality Motor Control

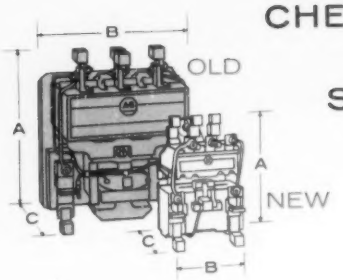
control...in 30 years!

New weld-resistant, cadmium oxide silver contacts close and seat firmly, eliminating the sliding motion that causes wear. The overload relays are also new and are not only completely *trip-free* but also *tamperproof*. Of course, they were designed to use the old Bulletin 709 heating elements you have in stock.

Brooks Stevens is responsible for the smart cabinet design—a distinct sales asset on any type of installation. Better write today for more information on this *revolutionary* new line of Allen-Bradley Bulletin 709 *quality* motor starters.

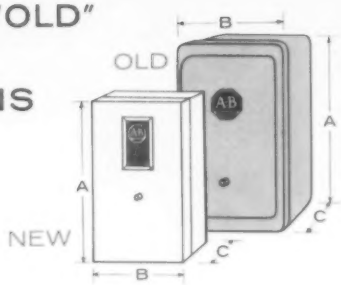
THESE NEW BULLETIN 709 ACROSS-THE-LINE SOLENOID STARTERS ASSURE YOU SUPERIOR PERFORMANCE IN YOUR TOUGHEST MOTOR CONTROL APPLICATIONS.

Note, also, the "family" likeness of all open type starters. Imagine the beautiful "special panel" engineering that can be done with this A-B family of starters, contactors, and relays.



CHECK THE "NEW" WITH THE "OLD" BULLETIN 709 SPACE-SAVING DIMENSIONS

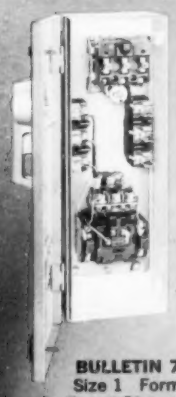
The wiring room in the new enclosure will delight the electrician.



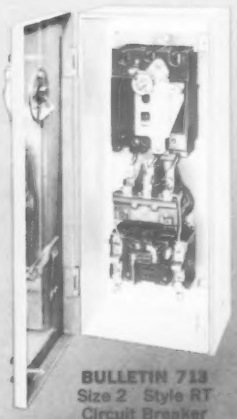
TOTAL OVER-ALL DIMENSIONS

Starter Size	OPEN TYPE STARTERS						NEMA 1 ENCLOSURES					
	NEW			OLD			NEW			OLD		
	Height A	Width B	Depth C	Height A	Width B	Depth C	Height A	Width B	Depth C	Height A	Width B	Depth C
00	3 5/8	3 7/8	3 9/16	—	—	—	7 5/8	4 7/8	4 1/4	—	—	—
0	5 7/8	4 1/16	3 11/16	5 5/8	4 3/4	3 1/4	9 1/8	6 5/16	4 3/8	7 7/8	5 5/8	4 1/4
1	6 5/8	4 1/2	3 11/16	5 7/8	5	3 1/4	10	6 13/16	4 3/8	8 13/16	6 3/8	4 1/4
2	7 3/4	4 5/8	3 11/16	10 1/16	5 3/4	4 7/32	12	7 5/8	4 3/8	14 1/2	9	5 7/16
3	10 1/4	6 1/4	5 7/16	12 5/8	7 1/4	5 7/16	16 5/8	10 3/8	7	19 1/2	11 3/8	6 11/16
4	11 7/16	7 5/16	6 1/4	16 1/4	12 3/4	6 15/16	22	11 5/8	8	26 9/16	14 3/16	7 11/16
5	14 13/16	9	6 1/2	20	16 1/8	8 3/4	32 3/16	17 3/16	9 7/8	41 1/2	19 9/16	13 5/16

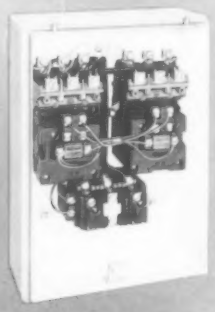
Also...other across-the-line starters in the NEW A-B design!



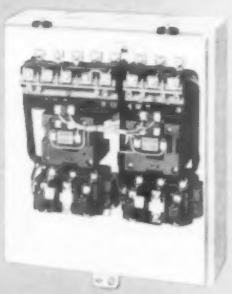
BULLETIN 712
Size 1 Form 2F
Fused Disconnect



BULLETIN 713
Size 2 Style RT
Circuit Breaker



BULLETIN 705
Size 1 Style RT
With Overload Relays



BULLETIN 715
Size 1 Two Speed
Consequent Pole

ALLEN-BRADLEY

Member of NEMA

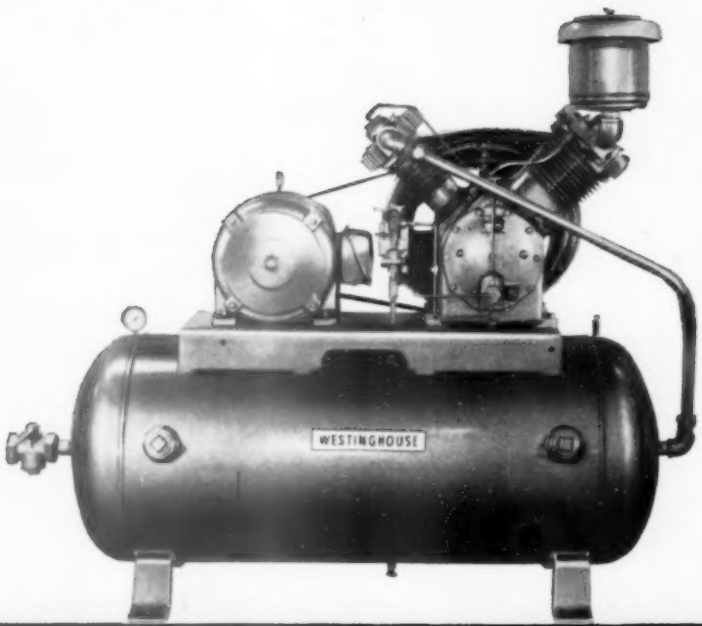
Quality Motor Control

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wisconsin

A-B QUALITY

9-61-RM

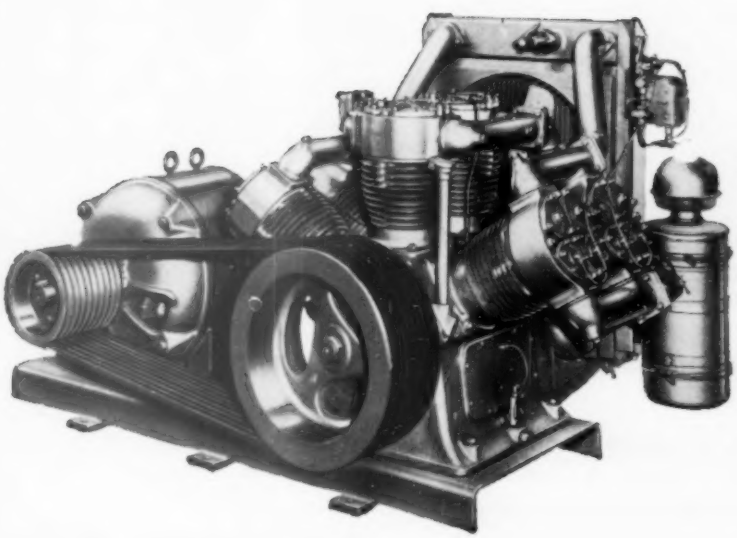
Make LE ROI your one-stop source for AIR COMPRESSORS



WESTINGHOUSE unit type ½ to 15 hp. 17 models: 2 to 71.7 cfm—80 to 250 psi

WESTINGHOUSE single- and two-stage compressors are ideal for jobs in the unit type class with moderate air demand. You get long-lived dependability at low first cost. Upkeep is negligible. Units incorporate thermal overload protection, positive starting unloader, air cooled deep-finned cylinders, and corrosion-resistant automatic spring loaded floating valves.

Crankshaft is ball-bearing mounted for stability, and matched V-belt set assures balanced drive line wear. Compressors are available with horizontal or vertical tank, or bed-plate mounting. Load-unload or start-stop control is standard. Options include dual control, water-cooled aftercooler, and automatic drain valve for receiver.



LE ROI stationary type 25 to 100 hp. 4 models: 92 to 450 cfm at 125 or 175 psi

LE ROI stationary compressors provide economical and flexible air power for your heavy industrial jobs. Made in 25, 50, 75, and 100 hp sizes, these two-stage units can be used as central air supply — or you can spot units at various points of use, thus minimizing pipe runs and air loss. Air-cooling permits indoor and outdoor use, and compactness conserves space.

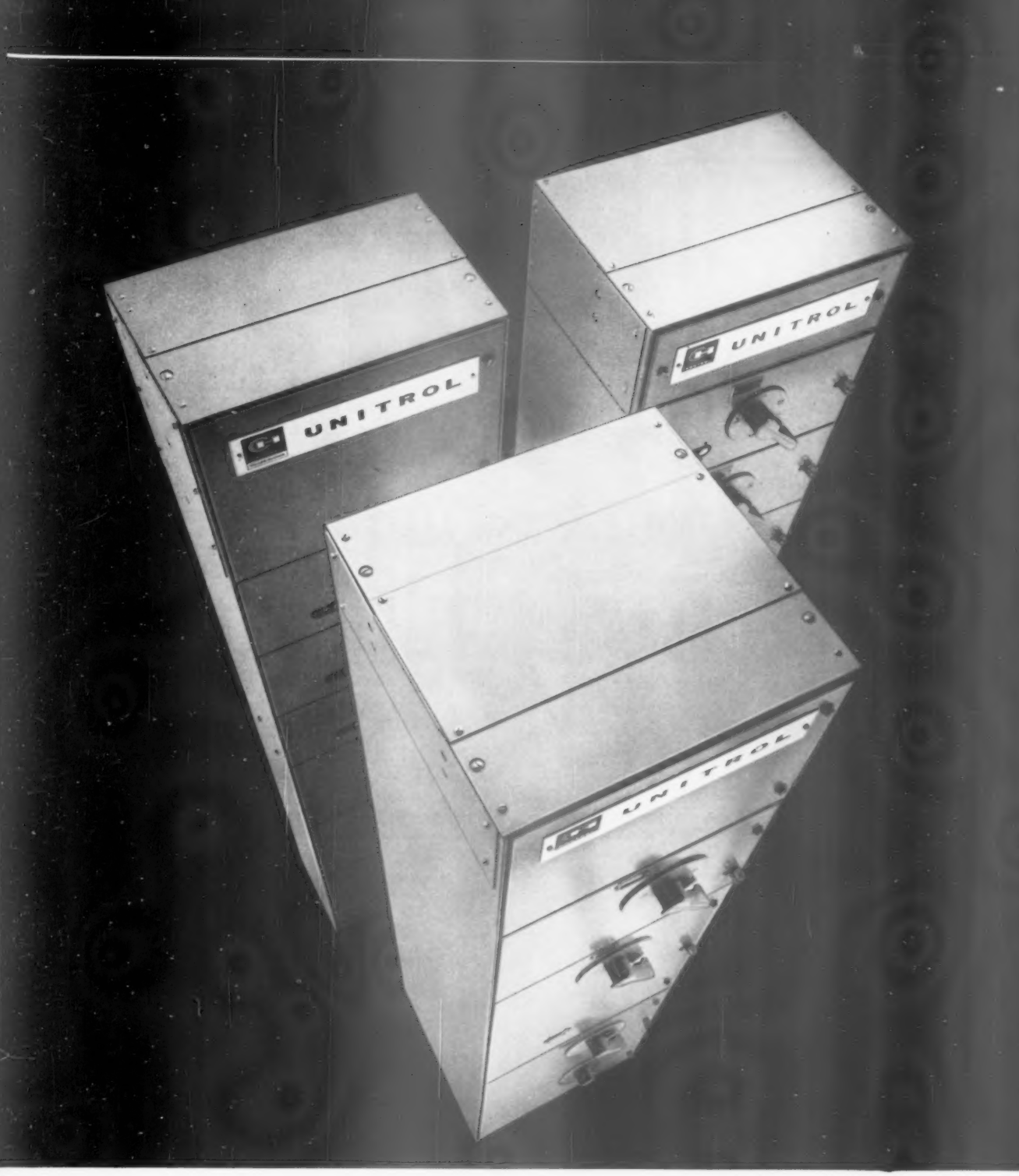
Features like forced-feed lubrication, large intercooler, high-speed fan, and balanced design extend motor and compressor life and cut upkeep. You can pick standard models with either dual control or continuous running load-unload control. Option extras include: crankcase oil filter, oil pressure safety switch, intake silencers, belt and intercooler guards, and water-cooled intercooler.

Ask your Le Roi Distributor for additional information. Or send for Bulletin SG-3 covering the entire line. Write to Le Roi Division, Westinghouse Air Brake Co., Sidney, Ohio.

SC-102

LE ROI Division of Westinghouse Air Brake Co. Sidney, Ohio

For more facts Circle 432 on Reader Service Card



WHO ELSE BUT CUTLER-HAMMER GIVES YOU ALL THESE FEATURES?

- Quick and safe maintenance
- All front connections
- Tough baked enamel finish
- Completely safe wiring troughs
- Add options . . . no crowding
- Vertical bus silver plated
- Quick latch door fasteners
- Five padlock locations
- 100% interchangeability
- Positive off-power test position
- Modular construction

CONTROL

Now! Cutler-Hammer Unitrol in two new shallow depths!

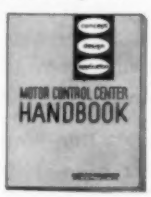
Get more compactness, more flexibility in motor control centers plus Cutler-Hammer dependability and safety

With Unitrol, you eliminate the high cost of mounting and wiring individual starters, as well as using far less space. Unitrol gives you flexibility, too . . . easy to change starters to fit needs and expand without disturbing other starter units. The two new shallow depths (15″ and 12″) make Unitrol practical even on catwalks or tunnels. Unitrol's modular design lets you put as many as 8 Size 1 starters in a single section and still leave room for many options.

But, probably more important is the safety factor built into Unitrol—safety for the men and machines. For instance, you can *lock* each unit in maintenance position for complete safety. Look at the features at the left for some of the extra values in Unitrol.

What's new at Cutler-Hammer? You can see the new spirit and vitality in a flood of new products and product improvements. Plant capacity has been increased. We've added new engineering talent to increase efficiency. Everywhere you look, you can see that we're ready to help you meet the challenge of the years ahead. Get the inside story from the Cutler-Hammer sales office nearest you.

NEW! FREE! BOOKLET: The "Motor Control Center Handbook" gives you practical facts on selecting the proper control as well as estimating for future needs. Send for Pub. LJ-1-G211 now!



WHAT'S NEW? ASK...

CUTLER-HAMMER

Cutler-Hammer Inc., Milwaukee, Wisconsin • Division: Airborne Instruments Laboratory • Subsidiary: Cutler-Hammer International, C. A. • Associates: Canadian Cutler-Hammer, Ltd.; Cutler-Hammer Mexicana, S. A.

CONTROL

Announcing 2 New RIGID CONDUIT BENDERS

EXTRA-DEEP SOCKETS MINIMIZE HANDLE BREAKAGE!

Cast of high-strength malleable, these new RIGID Conduit Benders have an exceptionally smooth, typically RIGID quality finish you'll like on sight. Look in the extra deep sockets, and you'll see the threads down at the bottom. Elimination of strain on threads of pipe handle reduces breakage.

RIGID Thin-Wall Conduit Benders Available in 3 Sizes

B-1677 Bends ½" Thin-Wall Conduit to 4" Inside Radius

B-1678 Bends ¾" Thin-Wall and ½" Heavy-Wall Conduit to 5" Inside Radius

B-1679 Bends 1" Thin-Wall and ¾" Heavy-Wall Conduit to 6½" Inside Radius

Exceptionally smooth side-walls hug conduit snugly . . . minimize distortion. Benders form conduit to meet National Electric Code Standards. Steadying foot pressure is easily applied on non-slip step plate. Easy-to-see arrows give accurate guide for back-to-back and stub bends.

RIGID Hickey-Type, Heavy-Wall Conduit Benders

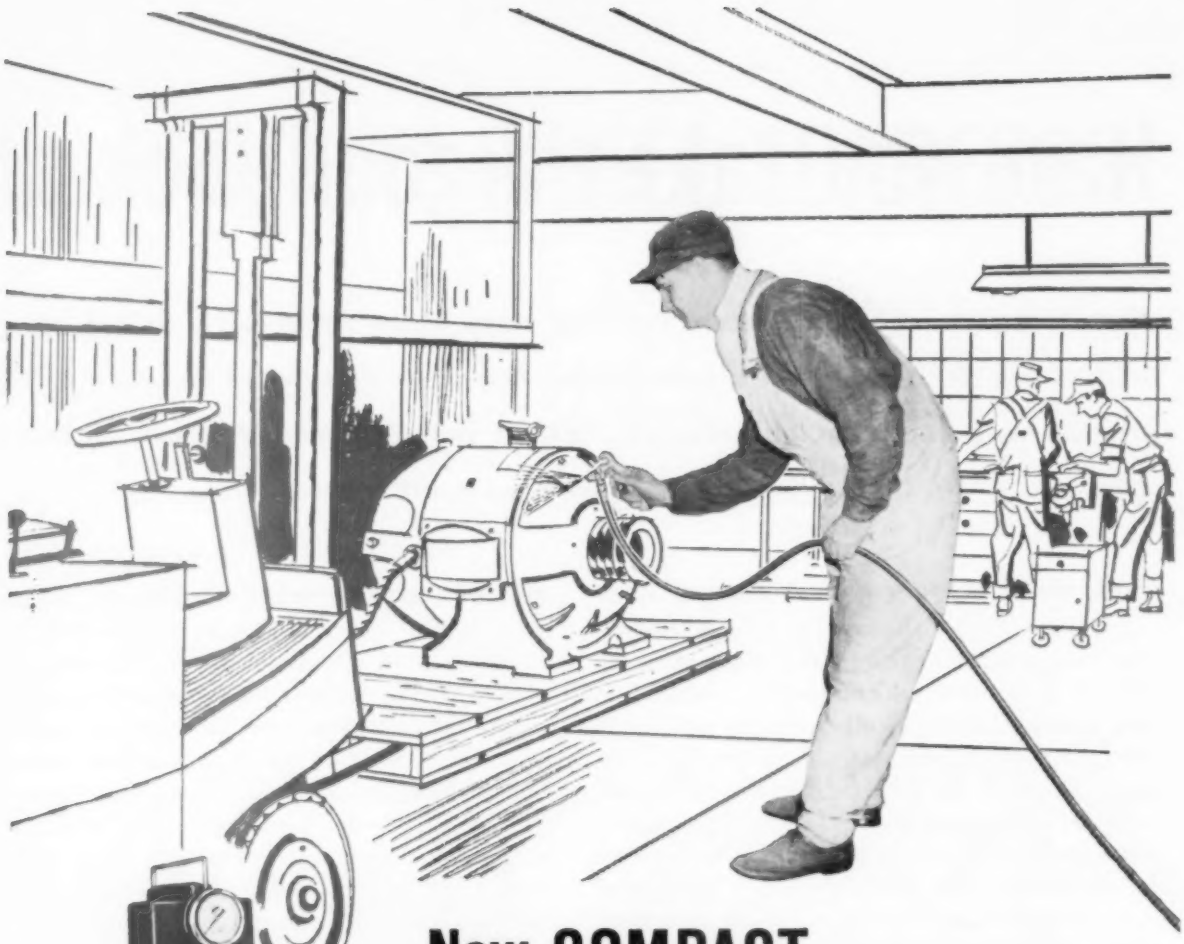
B-1711 Bends ½" and ¾" Heavy-Wall Conduit
B-1712 Bends ¾", 1" and 1¼" Heavy-Wall Conduit

Here's a rugged bender for heavy-wall conduit. Deep notch in lifting hook protects threaded ends. Face of bender has hardened teeth for safe, long wearing, non-slip grip.

RIGID

Call your Distributor today. For your convenience, he maintains a complete stock of RIGID Work-Saver Pipe Tools and parts!

THE RIDGE TOOL COMPANY, ELYRIA, OHIO, U.S.A.



New COMPACT airless spraying outfit

...an "extra" man for your maintenance department

New, economy model airless outfit . . . small enough to carry anywhere in the plant . . . large enough for a variety of maintenance jobs. Apply paint with minimum overspray, maximum coverage . . . paint goes on the surface where you want it, not into the air. Result: considerable savings in time and materials.

All metal surfaces of the airless outfit, exposed to spraying materials, are tough, non-corrosive stainless steel . . . ideal for indoor or outdoor use.

See your distributor about the new compact Binks Airless . . . or write for Bulletin A98-11.

Ask about our spray painting school. Open to all . . . NO TUITION . . . covers all phases.

Binks Manufacturing Company 3146 Carroll Avenue, Chicago 12, Ill.

REPRESENTATIVES IN PRINCIPAL U.S. & CANADIAN CITIES • SEE YOUR CLASSIFIED DIRECTORY

1102

Binks | Everything for spray painting

Have you taken a good look at

There's a difference in loaders. You may have heard about the new Cat wheel loaders and thought, "Here's just another line of loaders—what can they do for me that my present equipment can't? What's the difference in them?" If that's what you think, take a good look. There's a big difference.

THERE'S A DIFFERENCE IN PERFORMANCE—only Caterpillar wheel loaders have automatic positioners that set the bucket or tine loading angle while the operator is maneuvering into position, and lift and stop the bucket automatically while the operator is driving to the bin or dump area. They speed up every cycle, do part of the operator's work for him automatically. Cat wheel loaders have fast power shift transmissions that give fast, smooth shifting forward, reverse, 1st and 2nd speeds. Travel or work speed range selector also shifts from two- to four-wheel drive. Controls are power boosted for easy operation, fast response.

Cat loaders offer you dependable Cat Diesel Engines that operate on low-cost furnace oil—optional gasoline engines on the two smaller models.

THERE'S A DIFFERENCE IN SAFETY—the operator never had it so good or so safe. He mounts a Cat loader up three wide steps, no climbing over tires or struggling up ladders. Fenders protect him. He's comfortable, confident and safe; and so are the men working around him. Because of the excellent visibility from a Cat loader, the operator can see where he's going and what he's doing through every part of the cycle. Safety men notice that the lift arms and hydraulic cylinders are all in front of the operator, not moving up and down on each side of him. And besides safety, the design provides extremely long reach and high lift.

THERE'S A DIFFERENCE IN SERVICE—Caterpillar Dealers are accustomed to providing service on an around-the-clock basis to their customers. Their

FORK LIFT in warehouse miscellaneous handling. This 922 can work in only 8 feet of aisle space.

2 YD. BUCKET is standard—note the 944's long reach. Material handled: shale-clay at the Virginia Lightweight Aggregate Corp.

the NEW CAT WHEEL LOADERS?

factory-trained service staffs know the importance of keeping equipment running. You can count on your Cat Dealer for expert service, any time, anywhere. Genuine Cat parts are always available. The Cat loader you buy today will have a parts stock behind it as long as you're using the machine.

Shouldn't you take a longer look?

We'll gladly send you more information and complete specifications on the new Caterpillar wheel loaders. Just send in the coupon or, better yet, look in the Yellow Pages and call your nearby Caterpillar Dealer. He knows heavy equipment and has some good answers for your material handling problems!

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

CATERPILLAR

Caterpillar, Cat and Traxcavator are Registered Trademarks of Caterpillar Tractor Co.

TRAXCAVATORS ARE MAKING OTHER LOADERS OBSOLETE

3 MODELS
to match any job!

966—2¾ cu. yd. standard bucket—140 flywheel HP
Dumping reach @ 7′ height: 57″
Maximum lift: 12′10″

944—2 cu. yd. standard bucket—105 flywheel HP
Dumping reach @ 7′ height: 51″
Maximum lift: 12′

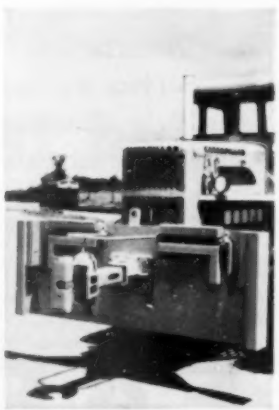
922—1¼ cu. yd. standard bucket—80 flywheel HP
Dumping reach @ 7′ height: 41″
Maximum lift: 11′2″

ATTACHMENTS
for bulk material handling

Whatever you'd like to move, load, unload, stockpile, stack or dig with a wheel loader, there's most likely a Traxcavator attachment to help you do the job. If there isn't, just tell your Caterpillar Dealer what you want from a machine—he has the facilities to help develop an attachment that meets your specific needs.

Current attachments include buckets to handle any weight or type of material, side dump buckets, bulldozers, forks, snowplows, snow blowers, pipelayers, backhoes and cabs.

SIDE DUMP BUCKET—another Caterpillar exclusive—permits the rig to dump to left, without turning, or forward.



FREIGHT CAR COUPLER and pusher is an example of a special attachment made by a Caterpillar Dealer.

CATERPILLAR TRACTOR CO.
Dept. L-236, General Offices, Peoria, Illinois, U. S. A.

Gentlemen: Please send me more information on Traxcavator wheel loaders for industrial bulk materials handling.

I am particularly interested in _____ (model number)

for handling _____ (names of materials regularly handled)

We presently use _____ (type of equipment) (model)

_____ (bucket size or capacity)

Name _____

Title _____

Company _____

Address _____

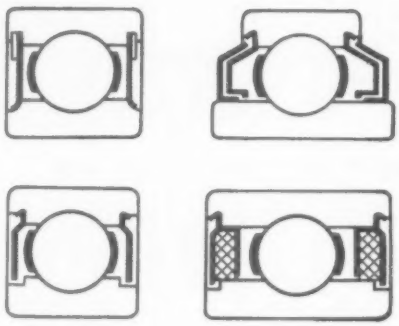
City _____ Zone ____ State _____

Telephone _____ Extension _____

For more facts Circle 436 on Reader Service Card

Here's one good reason for replacing with FAFNIR BALL BEARINGS

Dirt, moisture, steam, fumes, acids . . . Fafnir has sealed or shielded ball bearings to protect against them. In this all-inclusive line are bearings designed to operate at any speed and in any contaminant. If short bearing life is your problem, there's a Fafnir Ball Bearing to solve it.



...and here's another...your Authorized Fafnir Distributor

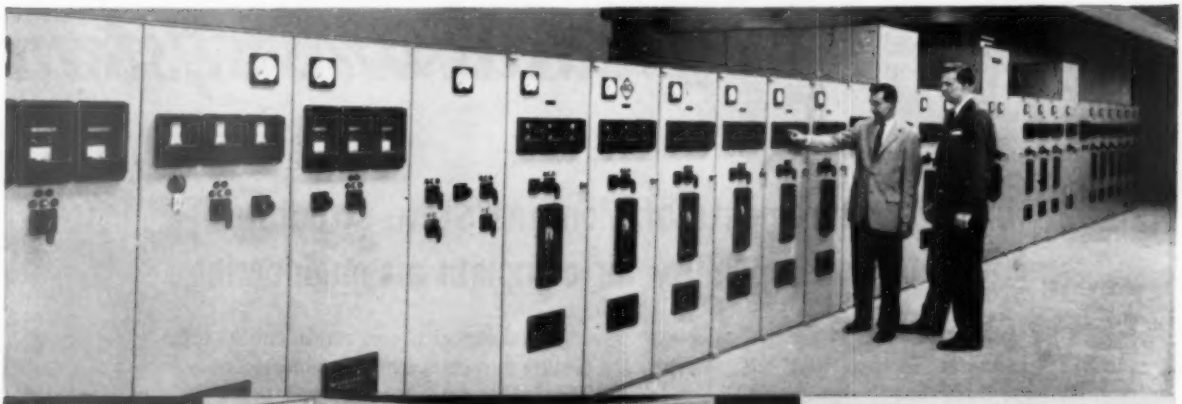
Your Authorized Fafnir Distributor has everything you need in ball bearings . . . all types, all sizes, for all purposes. And he's ready to help — day or night — when you need bearings in a hurry!

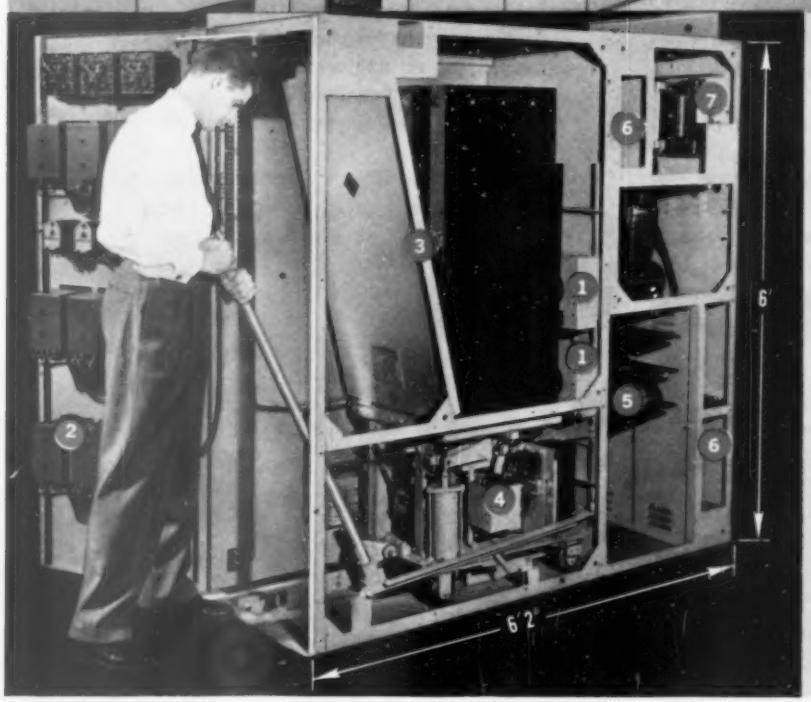
For job-perfect replacements . . . for top-flight service . . . for sound advice on bearing problems, . . . call your Authorized Fafnir Distributor. Like you . . . he is paying his share of U. S. taxes. The Fafnir Bearing Company, New Britain, Conn.

FAFNIR
BALL BEARINGS

For more facts Circle 437 on Reader Service Card

ALLIS-CHALMERS





▲ 4.16 kv metal-clad equipment serving a west coast city.

1. Separate compartments for current transformers.
2. Full panel metering and relaying.
3. Double-lock panel for operator safety.
4. Easy service accessibility without dismantling.
5. Glass polyester insulation throughout.
6. Separate up-feed and down-feed cable compartments.
7. Fully cast, trunnion-mounted potential transformers.

Lowest height, easiest access

the only switchgear with fully isolated current transformers

The front-accessible current transformers can be inspected, maintained or replaced without exposure to any high voltage compartment. A-C metal-clad units are just 72 inches high — means eye-level instrumentation . . . shoulder-height accessibility of component parts. And the entire panel can be used for meters and relays. Maximum compartmentation and dead-front construction offer greater safety. Buswork and components arranged for easy addition of future units.

You get rapid, one-stroke insertion of the circuit breaker. The breaker has glass polyester insulation for highest impulse strength . . . the only self-locking protective barrier . . . four-bar linkage is mechanically, electrically trip-free. Primary disconnect fingers eliminate use of garter springs, and are on the circuit breaker for easy inspection. Both stored energy and solenoid operators are available. *For more switchgear information contact your nearby* **Allis-Chalmers** *office.* A-1457

For more facts Circle 438 on Reader Service Card

Circle 439 on Reader Service Card for items on next page

All the air problems of this solved with *one system*

Unique requirements of Montana State structure point up AAF's capability for complete air engineering

WHEN you decide to house the departments of Zoology, Wild Life, Microbiology, Bacteriology and Public Health in one building, you know that some special and unusual air problems must be solved.

The air in Montana State's Health Sciences Building had to be cleaned, cooled, heated and moved—all in varying degrees to meet the special needs of animal environment and isolation rooms, surgery rooms, sterile transfer rooms and research labs.

The job called for many different types of component equipment plus the knowledge and experience to coordinate its functioning into one custom-engineered system. The building planners turned to AAF — the one company that provides all the major components for an engineered air system. Result: one system of completely conditioned air . . . one responsibility for its performance.

Booklet 518 describes the complete line of AAF component products. For a free copy, address Mr. Richard Smith, American Air Filter Company, Inc., 361 Central Avenue, Louisville, Kentucky.

American Air Filter

BETTER AIR IS OUR BUSINESS

AIR CLEANING: (Atmospheric Dust) AAF electronic air cleaners, viscous impingement filters, *dry-type filters*, engine & compressor filters. (Process Dust) electrostatic precipitators, wet-type collectors, dry-type collectors, fabric arresters. AIR CONDITIONING, HEATING & VENTILATING: Herman Nelson *air conditioning unit ventilators*, unit ventilators, portable heaters; Kennard/Nelson dual-duct air conditioning units, *multi-zone air conditioning units*, packaged central station air handling units, sprayed-coil dehumidifiers, *fan-coil units, packaged liquid chillers, cooling towers*, evaporative condensers, direct-expansion coils, water coils, steam coils, unit blowers, industrial exhausters, centrifugal fans, unit heaters, radiation products; Illinois traps, valves, specialties, heating systems and controls.

● *Italics denote products used in Health Sciences Building*

HEALTH SCIENCES BUILDING, Montana State University, Missoula, Montana. Architects & Engineers: Witwer & Price, Missoula; Structural Engineers: Lyerla & Peden, Spokane, Washington; Electrical Engineers: James F. Parr, Hamilton, Montana; Mechanical Contractor: Reber Plumbing & Heating, Helena, Montana.

university building from *one source...*

AAF

AIR CLEANING PRODUCTS
Air Filters
Dust Collectors

AIR CONDITIONING, HEATING & VENTILATING PRODUCTS

COMPLETELY CONDITIONED AIR

New Mobilmet

Whether yours is a production or job-shop operation, you can benefit from new Mobilmet oils because they assure superior tool life, excellent finishes and reduced staining in the machining of an unusually wide range of metals.

Mobil

- **In production operations** this means reduced unit costs. And by using fewer cutting oils, you save through quantity purchases and handling.
- **In job-shop operations** this means greater profits per piece. And, you reduce machine downtime for draining, changing, or blending cutting oils.

The reason for the unique versatility of Mobilmet oils is a new additive combination, developed and patented by Mobil, which is pressure-temperature selective in its activity—highly effective over the wide ranges of cutting pressures and temperatures produced in machining various metals with greatly different physical characteristics. As a result, a single Mobilmet oil is useful for both tough, draggy metals and hard, brittle metals.

Check the benefits new Mobilmet oils offer you. For complete information mail the coupon at right. Mobil Oil Company, 150 East 42nd Street, New York 17, New York.

INCREASE PROFIT PER PIECE IN JOB SHOP OPERATIONS...

Oils *multi-metal cutting fluids with unique pressure-temperature selective additive composition*

MOBILMET OILS OFFER YOU!

1 *Greater machine output*

A. More pieces per hour through increased feeds or speeds

B. Reduced time-out for tool changes

2 *Lower tool costs*

A. Fewer tool grinds

B. Less metal removed per tool grind

3 *Reduced loss from rejects*

A. Dimensional tolerances maintained

B. Surface finish improved . . . with possible elimination of additional finishing operation

4 *Simplification of cutting oil requirements*

For more facts Circle 440 on Reader Service Card

Mobil Oil Company, Room 2058-I
A Division of Socony Mobil Oil Company, Inc.
150 East 42nd Street, New York 17, N. Y.

Gentlemen: I am interested in learning how new Mobilmet oils can help in my metalworking operation. Please provide further information.

*Name*_____

*Position*_____

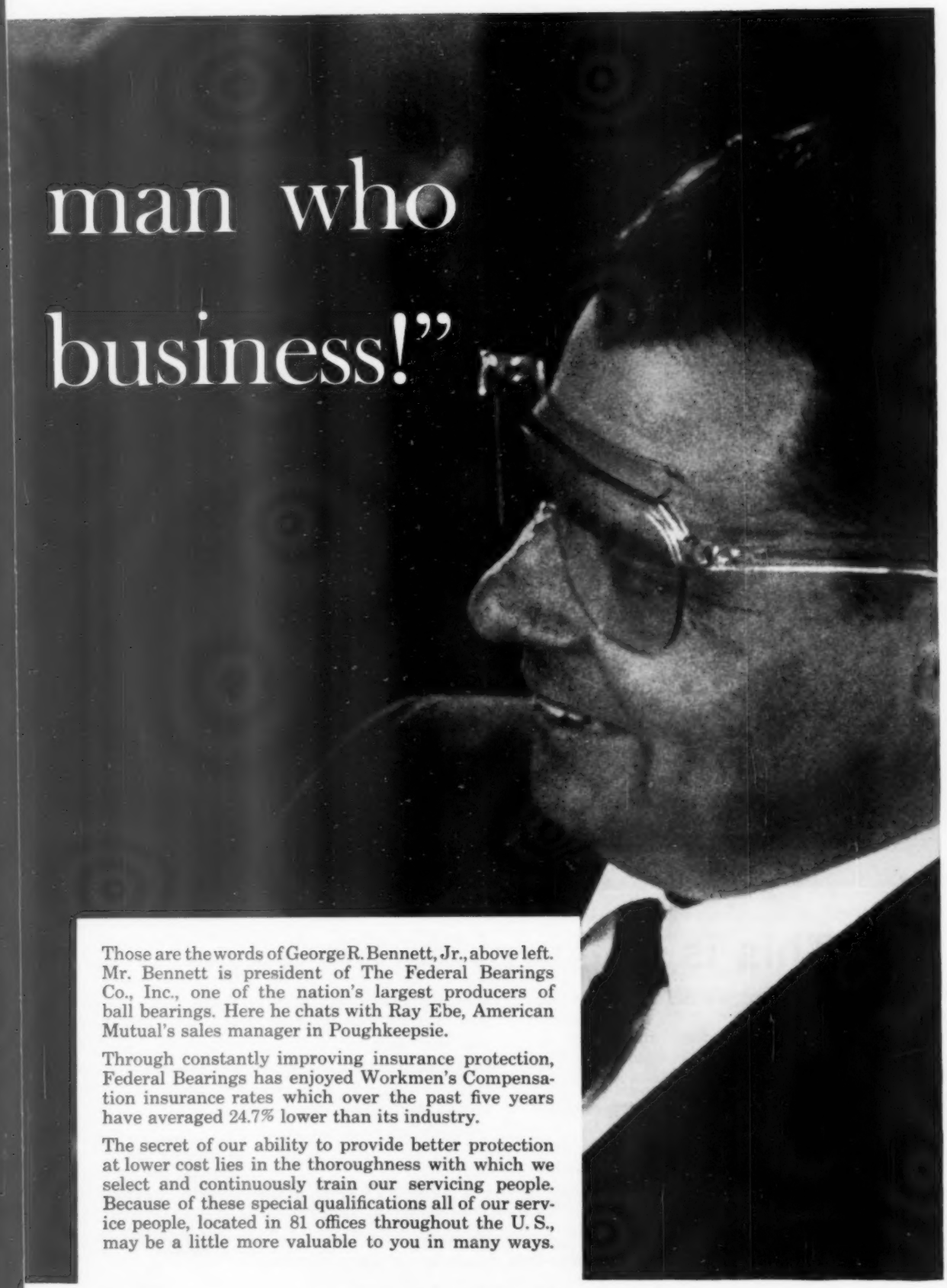
*Company*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

*(Check one): Job Shop*____ *Production*____ *Combination*____

"I like a
knows his
"I like a man who knows his business. Ray Ebe does, and so do his people here in Poughkeepsie. It's a pleasure to work with them. You feel confident they'll do a good job for you."
American Mutual
LIABILITY INSURANCE COMPANY
Your American Mutual Service Executive is in the Yellow Pages. He is an expert in Workmen's Compensation, all forms of Liability, Crime, Accident and Health Insurance.
© 1961, American Mutual Liability Insurance Company
Wakefield, Massachusetts

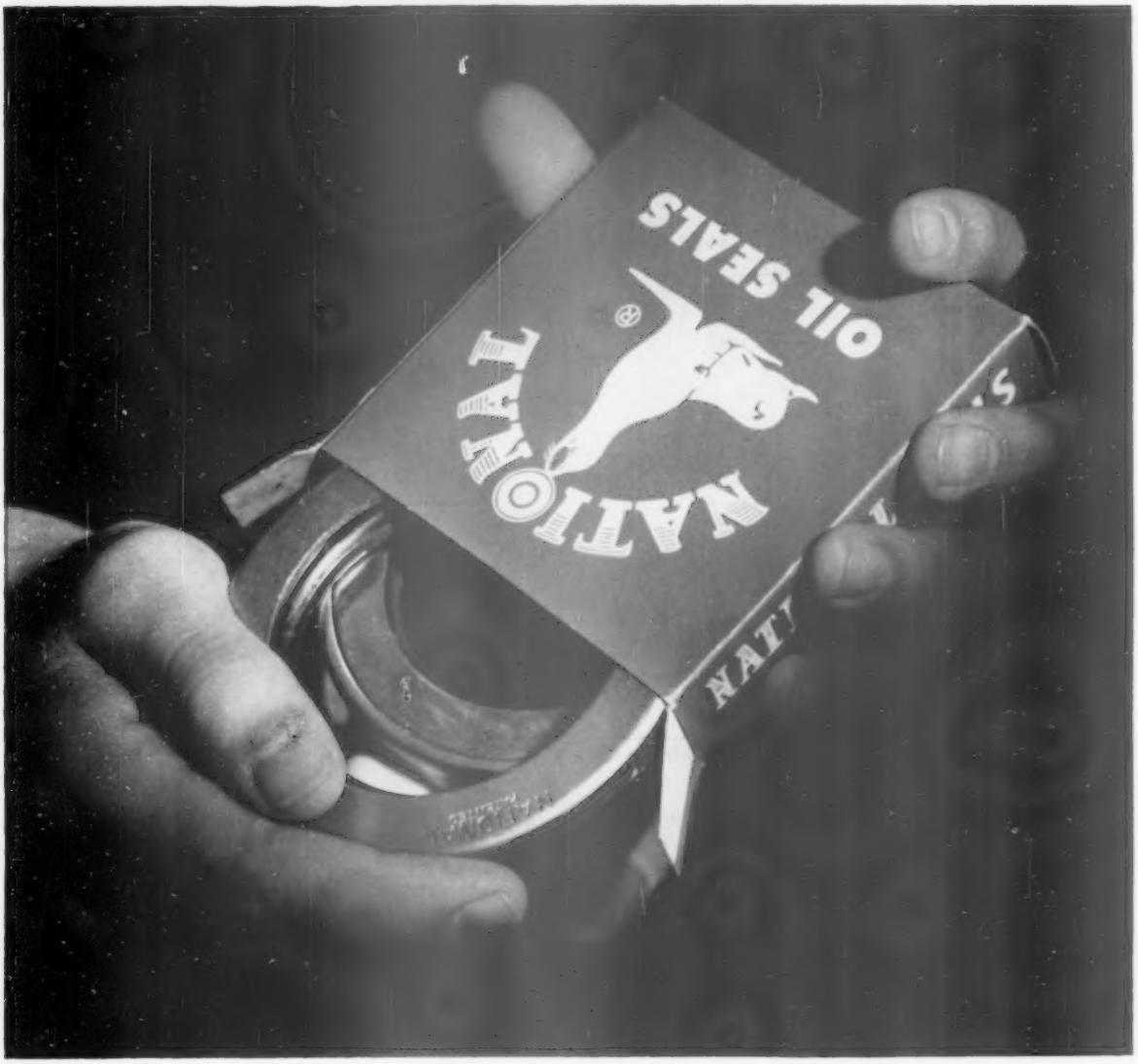


Those are the words of George R. Bennett, Jr., above left. Mr. Bennett is president of The Federal Bearings Co., Inc., one of the nation's largest producers of ball bearings. Here he chats with Ray Ebe, American Mutual's sales manager in Poughkeepsie.

Through constantly improving insurance protection, Federal Bearings has enjoyed Workmen's Compensation insurance rates which over the past five years have averaged 24.7% lower than its industry.

The secret of our ability to provide better protection at lower cost lies in the thoroughness with which we select and continuously train our servicing people. Because of these special qualifications all of our service people, located in 81 offices throughout the U. S., may be a little more valuable to you in many ways.

Better products, *faster,* from your National Seal distributor:



This is no surprise package

When you open a box of National Oil Seals, you know exactly what to expect . . . a quality product. Micro-Torc® leather and Syntech rubber seals are results of the finest engineering, design and testing techniques. They protect bearings better and longer.

To keep machinery running smoothly, replace used seals with new National Oil Seals. Your bearing specialist will help you set up a service stock with the right seals to keep your standby inventory in balance. (National Oil Seals are phosphate coated to protect against rust and corrosion while in the crib or shelf.) Call him today.

NATIONAL OIL SEALS

FEDERAL-MOGUL SERVICE

DIVISION OF FEDERAL-MOGUL-BOWER BEARINGS, INC. • DETROIT 13, MICHIGAN

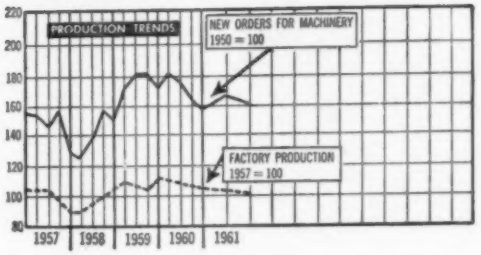
For more facts Circle 442 on Reader Service Card

LOOKING AHEAD IN BUSINESS

A FACTORY PRESS TIME REPORT

Indicator	FEB.[p] 1961	JAN.[r] 1961	FEB. 1960
New Orders for Machinery (exc. elec.)[1]	161.0	166.0	164.0
Contracts for Industrial Construction[2]	155.0	163.0	159.0
Factory Production[3]	101.0	102.0	110.0
Consumers' Prices (cost of living)[4]	127.5	127.4	125.6
Industrial Prices (materials, supplies)[4]	128.0	128.0	128.7
Manufacturing Employment (millions)[4]	15.5	15.6	16.5
Total Employment (millions)[5]	64.7	64.5	64.5
Unemployment (millions)[5]	5.7	5.4	3.9

[p] = preliminary [r] = revised



Sources: 1. McGraw-Hill Dept. of Economics (1950 = 100); 2. Engineering News-Record (1950 = 100); 3. U. S. Federal Reserve Board (1957 = 100); 4. U. S. Dept. of Labor, Bureau of Labor Statistics (1947-49 = 100); 5. U. S. Dept. of Labor, Bureau of Labor Statistics.

Timing of upturn still foggy

THE OUTLOOK

On the strength of new forecasts from Washington and slightly increased retail sales activity, you can expect a boost in business strength before midsummer. Big inventories appear to be a thing of the past.

The end to the current economic slump appears imminent, according to a steady flow of business news produced in recent weeks. And although you cannot yet pinpoint the timing of a business upswing, chances are good that it is not far ahead.

One reason for an optimistic turn in the business outlook is the latest Department of Commerce report on industry's capital spending plans for 1961. Like the McGraw-Hill survey late last year, the more recent Commerce study indicates that spending for new plants and equipment will dip only 3% in 1961.

Compared with cutbacks in capital outlays in other recent business slumps, 3% for this year is mild indeed. (In 1958, for example, outlays were sliced nearly 17%.) A drop of 3% leaves capital expenditures at a level high enough to insure that business as a whole will continue to move along at a pretty rapid clip in the months ahead.

Most important, the government survey suggests that capital spending will again be on the rise before year-end. Thus, if current plans are implemented, growing business investment will be one force assuring economic expansion later this year.

Inventory reductions—a major reason for cutbacks in factory output in recent months—are continuing. But there are strong indications that stock-cutting will soon taper off.

Inventory trimming has largely been concentrated in durable goods producing industries. In this sector of the economy, stocks were hastily built up in 1959 to avoid shortages threatened by the steel strike. Further additions were made later in anticipation of a surge in durable goods sales in 1960.

As it turned out, sales and new orders trends for durable goods producers through most of last year were generally downward. This reduced business volume induced manufacturers to cut inventories. More recently, though, stock levels have begun to fall in line with requirements, and the pressure to cut inventories has declined.

In February, sales and new orders of durable goods manufacturers actually registered a gain, enhancing chances of an early end to stock-cutting.

Taken by itself, one month's improvement in orders and sales is not convincing evidence of a whole new turn in the business outlook. But considered in the light of other recent developments, it takes on considerably greater importance.

Moreover, you can add to other favorable indicators a 1% rise in retail sales durng February. The gain is not an impressive one. But it came despite a decline in personal incomes during the month, suggesting a great deal of underlying vitality in the all-important consumer sector of the economy.

WASHINGTON WIRE

A FACTORY PRESS TIME REPORT

PINPOINTING YOUR STAKE IN WASHINGTON THROUGH INSIDE REPORTS ON AFFAIRS VITAL TO PLANT MANAGEMENT.

Even before the final ballot was counted giving Mr. Kennedy the Presidency, FACTORY *readers had begun to ask: "What do you think they'll do about taxes, contracts, automation . . ." The Washington Wire was created to answer those questions. It will appear as a regular monthly feature in this space.*

President Kennedy's honeymoon with Congress—if there ever was one—is over. And a business upturn, if and when it comes, will only add to Kennedy's mounting difficulties with legislators. Congress seems disposed to give him the quickie measures he wants, such as a boost in the minimum wage, aid to depressed areas, help for the housing industry, medical aid to the aged, and even aid to schools if this is not sidetracked by religious and racial issues. But some of the programs he considers more vital to the long haul have run into a wall of seeming indifference in Congress. These include: reorganization of foreign aid, long-term commitments to Latin America, overhaul of the tax structure and a big federal scholarship program. An economic boom would rob Kennedy of his biggest ally—pressures on Congress to stimulate business.

A production management specialist has been hired by the Defense Department. His job: to ride herd on production lead times for military hardware—a perennial problem. James N. Davis comes to the Pentagon (Deputy Assistant Secretary of Defense for Production Management) from Bell Aerosystems Company of Buffalo, N.Y., where he was a vice president. His post is a new one at the Pentagon, created to shorten, if not to eliminate, the constant delays in pushing new weapons into production. Davis once served as vice president (for Government Operations) of Vertol Aircraft.

The drastic decline in factory employment is grinding to a halt. That at least, is the pious hope of the administration; and it represents a switch from a few weeks ago when the emphasis was on the dark side for the whole economy. The word from the White House is to strike a more cheerful tone—and such a note has been struck by three obliging cabinet officers—Dillon of Treasury, Hodges of Commerce, and Goldberg of Labor.

The specific picture, however, is this: Factory employment declined by one million between February 1960 and February 1961. One out of 10 factory workers was unemployed in late winter this year—one of four in autos, one of six in steel, one of 12 in machinery. The work week, at 38.8 hours, was down a full hour from a year earlier. Weekly earnings, at $90.02, were down more than a dollar.

Producers of conventional weapons can expect more business from the government. The move, started by the Eisenhower administration and speeded by Kennedy, represents a shift in basic U. S. defense strategy. Greater stress will be placed on readiness to fight limited wars without recourse to nuclear weapons.

The result will be expanded government development and procurement contracts for a wide range of items needed for limited warfare—vehicles, tactical weapons, light aircraft, electronic gear, howitzers, guns, etc. Over-all spending in this general area may be increased as much as $2-billion a year.

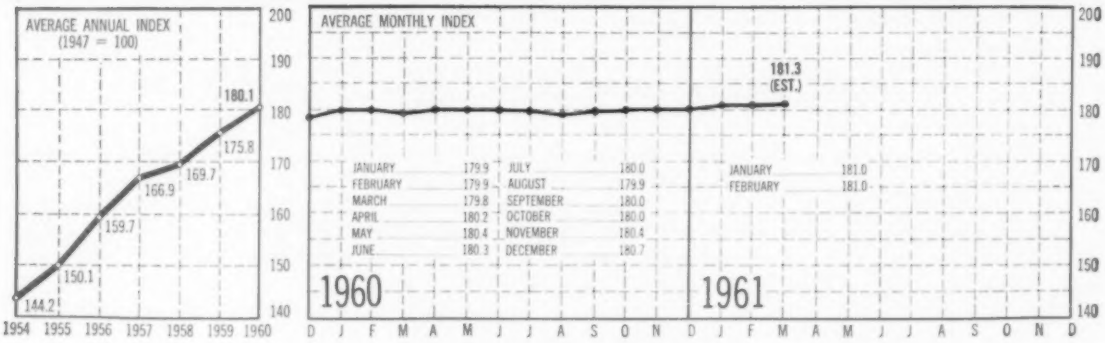
Small business will get a larger share of prime defense contracts, both because of the shift in defense planning and because of action taken by Kennedy and his aides. The President has ordered the Pentagon to step up the volume of contracts to small business by at least 10% over the fiscal 1960 rate.

The administration really means it this time. An aide to Deputy Defense Secretary Roswell L. Gilpatric told FACTORY that "we're putting teeth into this matter rather than paying it lip service as has been the case in the past." In fiscal 1960, small business received $3.5-billion-worth of prime defense contracts, or 16.1% of the total. Administration plans call for an extra $350-million to small business in fiscal 1962, which starts July 1.

For Problem-Solving Guide, turn back to page 4

COST INDEX OF PLANT MAINTENANCE

A FACTORY PRESS TIME REPORT



Index holds for second month

	AVERAGE 1960	FEB. (Preliminary)	JAN. (Revised)
Building and Facilities Index	170.6	171.9	172.0
Materials	140.1	138.5	138.6
Brick	154.9	155.5	155.5
Elec. fixtures	131.9	130.9	130.9
Elec. switches, boards, fuses	183.3	183.7	182.7
Elec. wire, copper	147.0	135.6	136.7
Glass	148.1	147.7	147.7
Gutters, spouts, ducts	180.3	180.4	180.4
Gypsum products	140.9	142.7	142.7
Heating equipment	125.5	121.4	136.9
Lumber	128.7	120.1	120.4
Millwork	156.7	154.5	236.3
Paint	130.2	134.0	138.4
Pipe, cast iron	170.4	170.4	163.1
Pipe, steel	190.7	188.7	162.9
Pipe & tubing, copper	151.5	117.7	121.4
Roofing	113.9	121.3	121.2
Sanitary fixtures	162.4	161.8	155.4
Sash, metal frame trim	137.4	136.9	133.4
Solder	122.5	120.4	170.4
Steel, structural	236.3	236.3	188.7
Tanks, steel	139.6	138.4	117.7
Valves & fittings	167.8	163.1	121.5
Wire mesh	163.8	162.9	161.8
Labor	191.0	194.2	194.2
Carpenters	177.3	180.9	180.9
Electricians	199.4	202.2	202.2
Painters	196.2	199.5	199.5
Equipment Index	184.2	184.9	184.8
Materials	177.6	178.2	178.0
Abrasives	157.9	157.3	157.3
Alloys, non-ferrous	123.2	117.6	117.7
Bars & plate, steel	227.2	227.2	227.2
Bearings	160.0	155.4	155.4
Belting	160.9	166.3	164.2
Bolts, nuts & screws	225.2	236.4	236.4
Chain	187.4	193.8	193.8
Controls (electrical)	183.3	183.7	182.7
Gear-reduction units	181.1	174.5	174.5
Hand tools, mechanics	204.5	205.5	205.5
Lubricants	125.7	125.7	125.7
Motors	145.0	143.2	142.5
Non-ferrous metals	135.8	126.8	126.8
Precision tools	158.2	158.2	158.2
Pumps	235.4	196.6	196.6
Tools, cutting	186.8	187.8	187.8
Valves & fittings	167.8	163.1	163.1
Labor	188.7	189.4	189.4
All mfg. labor	185.1	187.6	187.6
Machine tool labor	192.1	191.2	191.2
FACTORY'S COST INDEX	**180.1**	**181.0**	**181.0**

Reflecting a generally inactive industrial picture, FACTORY's Cost Index of Plant Maintenance remained unchanged in February at a level of 181. An increase of 0.2 of a point in the equipment component of the Index was matched by 0.1 of a point drop in the building and facilities section. When these two changes in materials prices were combined in the over-all index they offset each other. Labor costs, too, were unchanged.

Only 10 items among all those now listed in FACTORY's Cost Index posted a different price in February than in the month before. And all the changes were small. In the equipment section of the Index, belting prices were 2.1 points higher, while motors and non-ferrous alloys were off a fraction of a point.

In the building and facilities component of the Index, electrical controls gained one point. The index of paint prices was up 0.6 of a point. All other price changes were on the down side. Examples were lumber—off 1.1 points, millwork—off 0.9, and roofing materials off 0.2 of a point.

Labor costs, though stalled by recession worries this month, should begin climbing again as the year progresses. One year ago the economy was bounding higher after being freed from the uncertainties surrounding the steel strike. It seemed a sure bet that labor costs would soon be pushing higher. Before the unions could gird themselves for an assault on wages, however, the pace of business activity slackened. Since then, wage costs in the index of plant maintenance costs have been unusually quiescent. In the building and facilities sector, wages have risen about 3% since last February, while costs in the equipment sector have scarcely budged.

The pattern of *moderate* labor cost increases is likely to persist through 1961. Even though the economy is expected to regain some steam by autumn, demand for workers will not be strong enough to generate a significant amount of wage pressure. The prediction for 1961 calls for a 3% rise in labor costs.

LOOKING AHEAD IN LABOR

A FACTORY PRESS TIME REPORT

Union organizers plan attack

Labor leaders are on an organizing march. The initial thrust is being made in specific white-collar and industrial territories with some early success. Win or lose, the unions intend to push active membership drives in all non-union areas. Two major factors are behind the new drive: (1) AFL-CIO officials are stung by the dwindling of union members in the labor force; (2) they believe help will come from the Kennedy administration and an NLRB led by Democrats.

Here are the specific developments:

• The AFL-CIO's Industrial Union Department (IUD) has quietly opened a southern drive with headquarters in the Spartanburg-Greenville, S. C., area. This is an extension of the drive by a score of industrial unions that began in Philadelphia a year ago. The targets in the northern city have been mostly metalworking and electronics plants. In the south, efforts will be aimed at textile and garment mills.

• AFL-CIO leaders have revamped organizing tactics to eliminate roadblocks thrown up by their own unions. Heretofore, the AFL-CIO's 150 organizers have been barred from helping a union affiliate to round up members if a rival union in the Federation made a claim for the same workers. This rule has been junked.

• A major "white-collar" victory by AFL-CIO's communications workers has stirred hopes. CWA last month won the right to represent 18,000 Bell Telephone workers in New York City. They rejected their own independent union in an NLRB election.

• James R. Hoffa's Teamsters have organizing plans among white-collar workers and in all AFL-CIO jurisdictions. This is pushing the Federation to new efforts to outdo the maverick Teamsters' union.

At this stage, AFL-CIO strategy is to go slow, and quietly. Union officials believe publicity about their efforts will stir active employer resistance. Also, it will take time for an NLRB, led by Kennedy appointees, to come up with decisions it believes will help out—particularly in Board decisions regulating the methods used by employers to resist union organizing.

The AFL-CIO's top two—George Meany and Walter Reuther—are feuding in the open over, of all things, a broken appointment. When Meany failed to show as a principal speaker at a meeting of Reuther's Industrial Union Department, the Detroit labor leader bristled. Meany professed a busy schedule as an excuse, but didn't attempt to make any amends. This won't break up the united federation but insiders believe it could be a step in that direction.

•

A "sleeper" issue before the NLRB may provide clues to the direction the Board is going under its new chairman, Frank McCullough. When President Kennedy made his second appointment—Gerald A. Brown—to give the NLRB a Democratic majority on the five-man agency, it quickly faced a tough decision.

The United Auto Workers are asking a review of a recent Board ruling that the agency shop is illegal in Indiana, a right-to-work state. Previously the Board's Eisenhower appointees held it to be illegal to require non-union workers to pay fees equivalent to union dues to a union they are not required to join. The decision hurt the UAW, the United Steelworkers, and other unions that have adopted the agency-shop device to get around state bans on union security agreements.

•

The first signs are appearing that forecast a major battle in Detroit this summer. And as FACTORY predicted last month ("The Big Strikes," page 63), they're coming well in advance of the bargaining deadline for the auto industry and Walter Reuther's United Auto Workers. When Ford Motor Company's president, Henry Ford II, said labor costs would have to be held down in any new contract, Reuther fired back that the union did not intend to forego demands for wage increases. Both sides are already preparing their battle lines for negotiations. Both are aiming for public support of their positions.

The auto negotiations are a critical test for President Kennedy's Advisory Committee on Labor-Management Policy. One of its functions is to build a better climate for such contract talks.

SEE LABOR RELATIONS NEWS, PAGE 190

POWELL PERFORMANCE PAYS OFF

Any way you look at it, Powell performance really pays off. Take "availability" for instance.

You'll find that Powell makes just about any type of valve you may need—for oil, water, gas, steam, air and corrosive fluid applications. The same holds true for virtually any temperature and pressure. What's more, you'll find Powell valves are available in industry's widest selection of bronze, iron, steel and special alloys—from aluminum to zirconium. (The fact is, Powell pioneered application of special alloys in valve design.)

In short, you'll find Powell performance also includes outstanding availability—of exactly the type valve you need. And, since Powell maintains large stocks both at the factory and key points across the country—you get exactly what you need, when you need it. For further information, contact your nearby Powell Valve distributor or write The Wm. Powell Co., Cincinnati 22, Ohio.

125-pound All Iron Gate Valve. Outside screw rising stem and yoke. Flanged ends, 2" through 30". Screwed ends 2" through 8". Iron body bronze mounted valves also available.
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200 WOG
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125S
MS
POWELL
125
175-pound W.O.G. Semi-Steel flanged end Lubricated Plug Valve. Wrench operated. Sizes 1" through 4". Available also with screwed ends. Catalog of complete line on request.
125-pound Iron Body Bronze Mounted Swing Check Valve. Bolted flanged cap. Can be used in either horizontal or vertical position. Sizes, flanged, 2" through 18"; screwed, 2" through 4". Can also be furnished in all iron.

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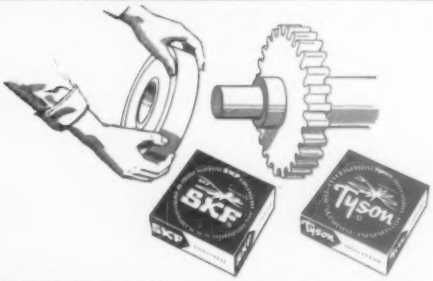
POWELL DEPENDABLE VALVES

THE WM. POWELL COMPANY CINCINNATI 22, OHIO

For more facts Circle 443 on Reader Service Card

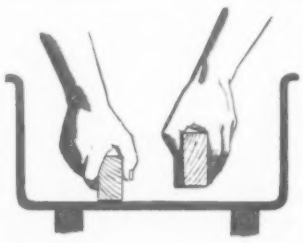
DISTRIBUTOR DAN, the SKF bearing man, says "TO SHRINK A BEARING ONTO A SHAFT GIVE IT A BATH IN HOT OIL"



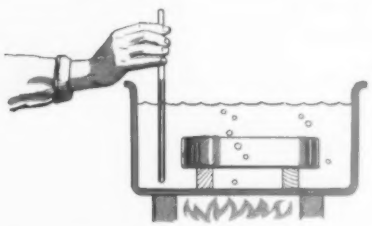
WHY HEAT IT, ANYWAY? If you need an interference fit, it's often convenient to shrink the inner race onto the shaft. To do this, you need to establish a difference in temperature. And it's usually easier to heat and expand the bearing than to cool the shaft.

SOME DO'S AND DON'TS. To heat the bearing, immerse it in hot oil. **Don't** heat the bearing over a flame. And **don't** heat it above 225°F. Plan to use enough oil—either quenching oil that has a minimum flash point of 300°F. or transformer oil.

CLEAN THE CONTAINER FIRST. If you reuse oil, make sure it's absolutely clean by filtering it carefully. Again, use plenty of oil—because too little may heat and cool too rapidly, causing the bearing to heat unevenly.



ANOTHER "HOT" TIP. Place a rack at the bottom of the container and set the bearing on it. This will prevent the bearing from touching the hot bottom. It will also separate the bearing from any contamination that may have settled on the bottom.



TO HEAT BEARING UNIFORMLY, place it in the bath as soon as heating starts. Or else allow sufficient time for entire bearing to reach temperature. Stir oil and heat at 200°F. for 15 minutes. Check temperature by immersing a thermometer near bearing.

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FACTORY

To save now, or spend?

At a time when most plant operations managers are being pressed for more cost cutting, it may seem facetious to urge a fresh look at spending opportunities in your plant. Yet they do exist. And for plants that can lay out the cash, *now* is truly a good time to buy.

Equipment prices are right, deliveries are excellent, and quality is on the rise. Your own relaxed production schedule means more time available to study new equipment opportunities. And the timing is right for installations that don't interfere with production. If past experience is any indication, when industrial activity does pick up, there will be increased demands upon your facilities.

On the other hand, there are cold realities to face. Companies trying to meet half-yearly dividends need a lot of persuasion to part with capital that isn't already earmarked. And if your boss is fighting to hold costs within a tightened budget, you can be sure he's got ingrown resistance to additional expenditures.

What is needed now is an enlightened viewpoint toward cost reduction. It's trite to say that "you have to spend to save." It isn't even true all of the time. Savings can be achieved quickly and wisely by cutting out or curtailing obvious frills. Production methods, too, can always be improved a little without laying out money for new equipment. However, there are many processing and service costs that can be reduced only by *first* purchasing new machinery or facilities. Every plant knows which these are and, in all probability, keeps a long list of such projects that are waiting only for necessary capital.

While the need for production equipment is fairly obvious (and its justification easier), reasons for service improvements are frequently obscure. Consequently, they are often deferred unwisely. There is a danger in deferring spending for service improvements until you need them so badly you'll pay any price for them.

Electrical power distribution systems are an outstanding example. Without putting a foot inside your plant, chances are your local utility can estimate that your electrical usage was up 5% last year over 1959, will be up another 5% this year, and 5% again in 1962. Inexorable growth like this burns up the slack in your system fast. Long-deferred improvements may even catch up with your motors and controls by the time your processes are fully back on the line later in 1961.

You should apply this reasoning to all plant services—water, fuel, ventilation, air, housekeeping, etc. By all means, apply it also to the manufacturing processes in which mechanization is a proven cost-cutter—material handling, production, information handling, and the like. To sell your choice of plant improvements to your boss, however, you must relate these projects to *product* improvement. Show how they will help build more into your product for less, how they make delivery guarantees certain, and how they will boost quality.

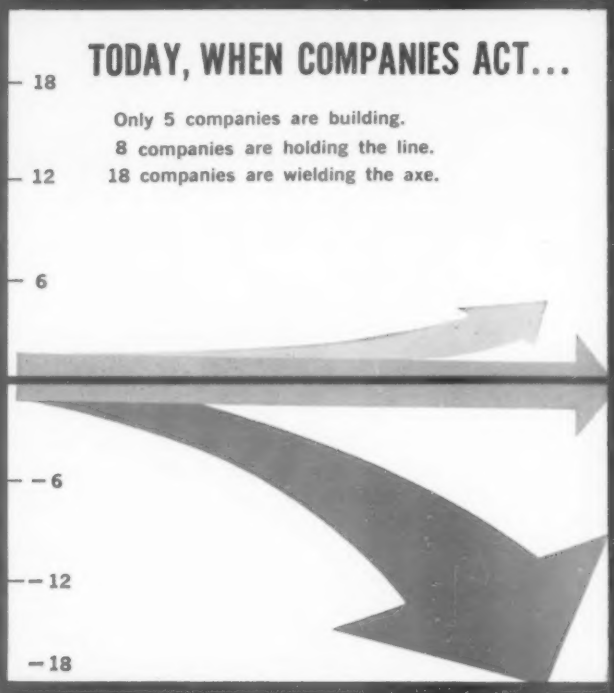
L. R. Bittel

EDITOR-IN-CHIEF

EXCLUSIVE REPORT

As headlines blare plight of hourly unemployed, many firms quietly purge salaried people too in a further effort to cut costs. Survey shows your plant, even your job, may be next as...

IN 31 COMPANIES SURVEYED,



Management wields the axe

Jostled by current economic troubles, many U. S. manufacturers are trimming management staff in an effort to cope better with an uncertain future.

This, in effect, is what FACTORY uncovered through a survey of 31 companies conducted during the last two months. The men we talked with operate in virtually every industry represented by our readership. They included the largest metalworking industries (like autos) and the smallest single-plant component manufacturers.

For the most part, the company spokesmen were vice presidents and managers of industrial relations—the men responsible for personnel practices. But they included chief executives and plant-level manufacturing managers.

Here's what you should know about the survey.

By LAWRENCE F. MIHLON
Associate Editor, FACTORY

The recession is a big factor

Of the 18 plant men who reported they were cutting staff complement, 13 said the cuts were directly forced by the profit squeeze. All said the recession heightened regular cost-cutting efforts.

One irate industrial relations man, whose company was especially hard hit, insisted our questions were ridiculous. He said: "Any company that isn't cutting its management across the board today will go out of business." In the next breath, he said that as soon as business picks up he would start reinstating people.

Another manager lamented the fact that his company (basic metals) hadn't yet recovered from the '58 recession. He has accepted the profit squeeze as a more or less integral part of doing business.

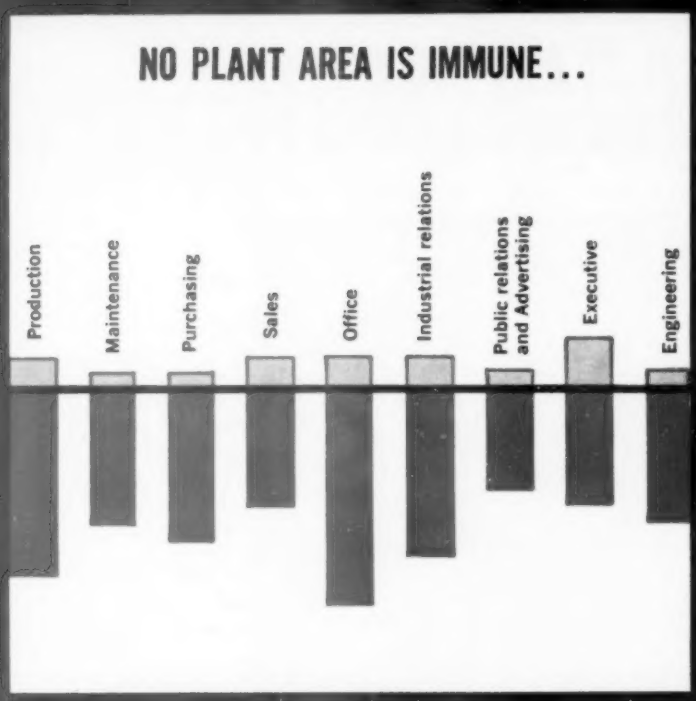
Several companies are making cuts despite a good year. In fact, they reported that the smaller staff idea has helped produce the good year. Commented a manager from one of these companies: "We've never stopped looking for places to cut. We're always operating undermanned. We've been doing it for the last five years."

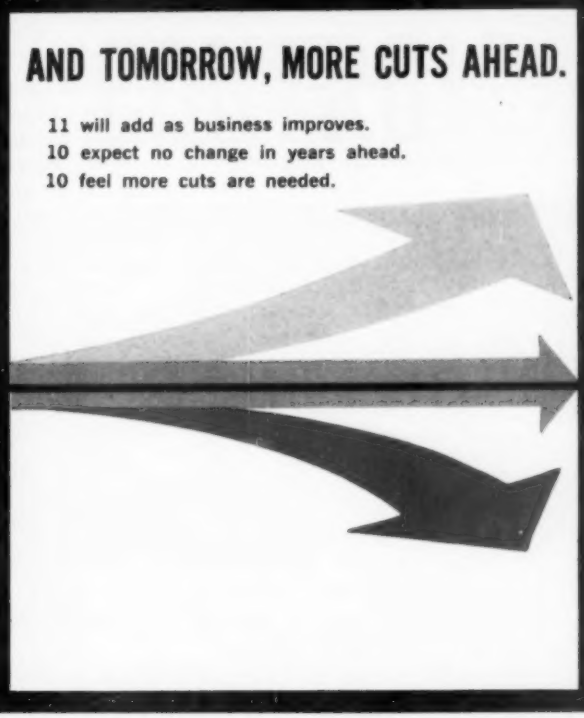
Some cut as much as 30%

Perhaps the most extreme case of staff cutting was executed at the Chrysler Corporation. Plagued by management scandals and slipping sales, the big automaker has reportedly lopped off some 7000 salaried and management personnel.

A midwestern manufacturer with plants around the country reported cuts as high as 30% in several of its divisions. An aircraft supplier said it had cut back its manufacturing staff 30% over the past two years. And in just six months, another midwestern company bumped over 25% of its big management and engineering staff.

TREND IS TO TRIM STAFF, GIVE IT MORE RESPONSIBILITY.




AND TOMORROW, MORE CUTS AHEAD.
11 will add as business improves.
10 expect no change in years ahead.
10 feel more cuts are needed.

A major electrical component maker reported it had taken particular aim at production control personnel: Result: Where once 25 men were needed, now four men and a big computer do the job.

Dead wood goes first

In most cases where managers reported cutting, they said nonproductive (clerical and office) people were the first target. Accounting personnel were especially hard hit as a result of wider use of automatic data processing.

After one industrial relations manager ended a confident report on his company's position, he asked: "By the way, do you know of anyone who needs an experienced industrial relations man?"

According to one usually reliable source, more than 1000 personnel managers hit the New York employment market during a single week late in February.

Office and personnel people are not alone when the axe is swung by top management.

"We're not just cutting excess weight," a metals company VP told FACTORY. "Normally essential production management is going, too. We apply a brutal test—if it isn't essential to staying in business *this year*, it's got to go."

From the chart above you can see that where cuts were made they affected just about every phase of plant operations.

Commented a particularly hard-boiled plant manager: "We *start* at the plant level when cuts are to be made—purchasing and maintenance people usually go first."

An overnight notice for some

When it comes time to swing the axe, here's how it's done:

On the average, salaried people are extended two weeks' to a month's notice. If the man is a top manager, and cuts have included vice-presidents, as much as four months is not unusual.

"We don't give notice," reported one manager. "With us, you're told Friday night that you won't be needed on Monday." He said his company offers a liberal separation allowance instead.

In most cases, every effort is made to assist the displaced manager in relocating. Where the company is large enough, lateral transfers are tried. One smaller company feels two weeks' notice and liberal severance is plenty.

Savings go beyond salaries

Once the axe has fallen, what further savings result on the plant floor for men who must then operate with a smaller staff?

Of the 18 companies who reported making staff cuts, 11 said they realized more than just salary savings from the move. The remaining seven have not yet analyzed the tangential savings.

"With a smaller staff on the plant floor we go through fewer motions, make decisions faster. We've realized as much as a 30% increase in productivity as a result of cutting," said one manager.

"Along with every salary dollar we save, we save on benefits, costs, stationary, phone calls, expense accounts," reported another.

"Since making our cuts (20% of total in one plant), we've seen tremendous savings in reports and procedures," a southern manufacturing manager said.

"By cutting across the board in

our plants we've realized savings in manufacturing overhead of over 26%," reported a small middle Atlantic manufacturing company.

Managers work "smarter"

To most managers reporting to our survey the psychological impact of the axe-wielding was more important than the immediate salary savings realized.

The vice president of an electrical parts maker viewed the trimming of his staff as heralding a return to "practical plant management." "With this smaller, more efficient staff, we've eliminated a third of our operating costs," he commented.

"By destroying the sacred cows of an overstuffed staff, our men are working harder and more efficiently," said one vice president. His company has been cutting and consolidating staff since late '59. While the rest of his industry struggles with lower profits, his company has posted 9-to-11% increases.

Several managers equated their staff-trimming activities with those practiced by the Navy in its Polaris ICBM program. By insisting that one good man do the job of three, Polaris became operational two years ahead of schedule. Shorter lines of communication between managers, and fewer "fingers in the pie" enabled faster, smarter decisions by program managers.

"Our remaining men aren't necessarily working harder than before. Rather, they're working smarter," observed the VP of a light industry.

The industrial relations manager of a big government contractor said: "The Polaris management philosophy is gaining special favor among defense contractors. Narrow profit margins and slow return on investment demand that you do the best possible job with the fewest possible people."

Most survivors react well

With few exceptions (they may be the only honest ones), companies that wielded the axe have seen positive reaction among the managers who survived. The industrial relations manager of a Pennsylvania company claims plant management attitude has never been so high.

What happens where survivors don't adjust readily to smaller staffs, and more responsibility?

"Where a line man can't operate without the big staff, and shouts a lot about the loss, he is soon doing his shouting somewhere else," replied the vice president of a big home products firm.

Electronics firms buck the tide

What happens to managers who get the axe?

At this stage it's pretty hard to say for sure. It depends on the kind of man displaced. Most companies try hard to avoid eliminating good young men. Early retirements are relied upon heavily to absorb the necessary trimming. But where business pressures are too great, even the best young men are finally bumped.

Where do they go after the axe?

Judging from our survey, the big electronics and consumer products makers are *building* management staffs. Service industries, too, will need more trained managers. With bigger government spending in certain aero space areas and in construction, these companies also will need more manufacturing managers.

Take electronics, for example. Up to this time most makers have survived on engineering and technical talent—talent that has consistently come up with the new product. Industry spokesmen now feel the "gee-whiz" stage is leveling off. They say sharp manufacturing men and methods will make the difference in the years ahead.

Tomorrow—more cuts coming

There seems little doubt that the trend toward the smaller staff will continue. You can look for more automation of plant management functions. Especially hard hit will be production control and maintenance. Look, too, for more consolidation. One company has already merged personnel management into its operating functions.

As the struggle for sales and profits gets tougher—and it will—faster, more efficient operations will be vital to survival.

Industries particularly susceptible to the smaller staff idea will be: basic metals, heavy fabricating, military, and process.

Oddly enough, when asked what areas they would beef up in the future, at least four managers said community and government relations.

We talked to one manager who had just returned to his job after being displaced during the 1958 recession. His department once had 16 men. Now there are four.

His comment on the future:

"The day of the big unwieldly staff is over. We've realized we can operate just as well without it."

THESE COMPANIES WERE SURVEYED

Allen Wood Steel Company
American Brake Shoe Company
American Can Company
Bendix Corporation
Cerro Corporation
Chrysler Corporation
Continental Can Company
Crane Company
Curtiss-Wright Corporation
Eastman Kodak Company
S. W. Farber, Inc.
Ford Motor Company
General Cable Corporation
General Electric Company
General Dynamics Corporation
Genesco
Hanson-Van Winkle-Munning Company
Heli-Coil Corporation
International Resistance Company
National Standard Company
Parker-Kalon
Philadelphia Gear Works, Inc.
Riegal Textile Corporation
Remington Rand Univac
Sharon Steel Corporation
Sperry Gyroscope Company
Talon, Inc.
Teleflex Inc.
U. S. Pipe and Foundry Company
Van Norman Industries, Inc.
Zallea Bros.

What's holding back

NUMERICAL CONTROL?

Eighty per cent of all machine shops have production runs of 50 pieces or less. But these potential users of numerical control are not yet using this new technological tool. Why not?

To answer this question, FACTORY accepted Boeing Airplane Company's invitation to spend several days in its Wichita, Kan., plant where numerical control (N/C) has been used for four years.

It's a down-to-earth manufacturing set-up, with people well qualified to comment objectively on the booby traps, growing pains, and future of N/C manufacturing. Included in the group are tool designers, tool planners, mathematicians, data processing experts, and ex-machinists.

N/C Manager Bob Wilburn (at right above with Production Editor Buzz Bussard) is a 12-year veteran of Boeing's 325-man machine shop. As Bob told us: "I may have a lot of theories about N/C, but I'm practical about one thing. It has to pay off in dollars."

It was from people like these that FACTORY obtained the following straight-from-the-shoulder answers to its questions about numerical control:

NUMERICAL CONTROL . . .

. . . is the automatic control of machine tools by means of numbers stored on punched tape or cards, magnetic tape, or some other storage medium. These numbers dictate the machine movement. Depending on the complexity of the system, this movement will be from point to point (e.g., spot drilling, where positioning is important) or continuous (e.g., shaping, where continuous guidance is needed).

WHERE CAN IT BE USED EFFICIENTLY?

Any multi-operational machining job now done conventionally can be done cheaper by numerical control. Biggest payoffs come in shops with short production runs or constant engineering design changes.

Almost all machine tools, from skin mills used in airplane plants to drill presses used in the smallest shops, are available with numerical control. Boeing uses profilers, turret lathes, Kellers, riveters, skin mills, and Milwaukee-matics (a multi-purpose machine). Automatic welders are being developed; N/C grinders are expected within a year.

But picking the right machine for your own shop is important. If you make the wrong choice it may decrease efficiency, rather than improve it.

The greatest efficiency is in increased machine run-

ning time, creating greater machine productivity. The N/C tool, through its flexibility, can replace the jig. Reduced set-up times free the machine for productive operation.

In the operation shown on page 67, the operator had just timed his drilling and milling of the aluminum gasket at 8 minutes, 25 seconds. When asked the time of conventional machining, he guessed: "One hour."

WILL IT INCREASE PLANT PROBLEMS?

Boeing found it did so at first. You might have to face some of the same problems. Maintenance can be a headache. But modular units and printed circuits have helped this. Initially, Boeing required two machines —one to run and one to cannibalize. But this is no longer necessary.

Programing can be a thorny problem unless there is close cooperation between tool designer and planner, the machine shop, and the part programer.

Accuracies of the new machines are good, but still not pushing the possibilities of the controls. Some N/C systems will control to 10 millionths of an inch, but they can't if the machine tool itself has operating accuracy in the thousandths.

Tool deflection or breakage will not be solved by N/C machines. They run through any programed path. If some obstruction hasn't been foreseen by the part programer, it will go through it—or break.

Methods of shop operation and organization may have to be revised. Tools may not have to be set at the machine but can be pre-set in the tool shop. New jobs may be created, such as the part programer. Design engineering and methods planning will be oriented more to the capabilities of the machine tool.

HOW CAN EQUIPMENT COST BE JUSTIFIED?

The new machines are expensive compared with non-N/C machines. They should be. They're better built, have higher cutting rates, faster traversing and feed rates. They turn out more pieces because design of basic machine is better. Added cost of the controls may be $30,000 on a turret lathe. One of the most costly tools is the Milwaukee-matic, costing $150,000 and up, depending on sophistication required. Smaller drill presses may cost $35,000.

Don't let anyone tell you that initial capital expenditure is the only cost. Other required costs include management orientation, operator training, maintenance and programing training—plus the operating costs of preparing tapes or other controlling mediums.

If your company is uncertain whether it can use numerical control, an evaluation study by qualified people might be justified. It could cost several thousand dollars—but be worth it. It might even prevent you from getting into N/C at the wrong time.

But no matter what the starting costs are, you can recoup them. Flexibility of these new machines insures increased productivity. One set-up can perform several operations. Tooling requirements are drastically reduced. A forging machined at Boeing on a conventional Hydrotel had a tooling cost of $33,000. When the same job was programed on a N/C profiler, tooling was only $7600.

Many plants justify N/C tools by shorter planning of lead time and set-up times. One part at Boeing used to require 5 days. Under its N/C program the planning lead time was reduced to one day.

Operation costs are another justification. Boeing gained a 3:1 advantage in shifting to N/C. It used to need 31 operators per shift for 36 conventional drills and mills. The 11 N/C machines replacing these need 11 operators—20 less per shift.

Reduced material handling between machines is another justification. At Boeing, N/C has reduced many intermediate steps between single-purpose machines. When handling represents 18% of the product cost, as at Wichita, a 30% saving in material handling can't be overlooked.

Finally, there is reduced inventory in materials. Boeing used to run some parts that required 4 months to shuffle back and forth between 10 different machines. On a multi-purpose machine the "in-process" time is reduced to one month.

HOW IMPORTANT IS PROGRAMING?

Extremely. It's the last big human effort in N/C and can't be overlooked. Some machine-tool salesmen may dismiss it as only picking up the engineering drawing, shaking it hard, and letting the numbers fall off on tape. But don't be misled.

Wonderful as they are, N/C machines will do only what they are instructed. They will not pick out the right tools, unless properly programed. They can't check to see if parts are located properly. But they will do exactly what they are told. If they are instructed to drill the first hole 4 inches off, they will drill all the holes 4 inches off.

Initially, programing will be up to you, although Boeing does help some companies just getting into N/C. Or it will help train your programers, as will Rohr Aircraft in the Los Angeles area. Some programing service bureaus may develop near you, but it seems best to have programing done in your own shop.

Programers may be college graduates, with training similar to manufacturing engineers. But they don't have to be. Boeing has upgraded machinists to the job. Whoever he is, a programer must have the ability to visualize an engineering drawing as a 3-D object, plus familiarity with machining.

A programer must know feeds and speeds. He must know cutters, tools, fixtures. He must be acquainted with the idiosyncracies of many machine tools. This is why machinists make good programers. The tool designer and production planner doing the programing must work closely together in determining cutter geometry. Tooling and programing are integral.

Programing does not require advanced mathematics, only what is learned in high school: arithmetic, extraction of square roots, algebra, geometry, and trigonometry. A tool designer may need calculus or analytical

geometry but not the part programer. He will work with whatever programing system you select.

If you want to consider computer assistance in programing, this will save time. Any part can be programed manually, but it takes time. A valve body at Boeing required 115 separate entries (steps) for center drilling, size drilling, and tapping 12 holes in the flange. A good manual programer took four hours to establish this. But Boeing's WALDO computer-assisted program does the same job in half an hour, with 21 entries. The computer translates the basic instructions into the same 115 steps required by the machine—and with greater accuracy.

Bob Wilburn has found that 99% of N/C errors occur in programing, not in the computer.

Don't forget that some auxiliary equipment is required for programing. To produce a punched tape manually requires an office machine costing $2500 to $4500. Computer assistance means access to a data processing unit. But buying equipment for this purpose alone is uneconomical; such a service can be contracted outside. Even Boeing uses its IBM 705 for N/C programing only 5 to 10% of the time.

In choosing cards, tape, or some other programing medium, Boeing recommends punched tape. It is more reliable and cheaper to use. Magnetic tapes cost more, are not as reliable. Small amounts of dust—even a human hair in the reader causes trouble. Recent standardization by the Electronics Industries Association on a standard 8-channel, 1-inch punched tape makes this a more universal system, too.

WHAT WILL MAINTENANCE PROBLEMS BE?

Half electrical/electronic and half mechanical/hydraulic. This has been Boeing's experience. To meet the situation, the company developed a hybrid maintenance man from the plant group able to service either trouble. It has never hired anyone from the outside just for N/C maintenance.

Personnel requirements should remain in the same mechanic-to-machine ratio. As number of machines is reduced, so is number of maintenance people.

Maintenance downtime may be high initially unless you have trained people. Too often Boeing has seen unprepared, inexperienced shops limping along on 25% downtime. It strongly recommends not bringing N/C machines into the plant until maintenance is ready.

At the Wichita plant, downtime now runs between 6 and 7% on the Keller profilers, and 15% on the skin mills. This includes both scheduled and non-scheduled maintenance. Boeing attributes this to a good preventive maintenance program.

Bob Wilburn also recalls a new user of numerical control that was experiencing 50% downtime on a machine that had been programed at maximum allowed speeds. When Boeing suggested they reprogram for a lower speed, downtime fell to less than 10%.

WILL IT BE ACCEPTED THROUGHOUT PLANT?

At Boeing it has had a good reception. It may be partly due to training on some aspects of numerical control that has touched over 4000 people at its 23,000-man plant.

Also, because N/C tools have been developed under government (Air Materiel Command) sponsorship at Wichita, they have had a good reception. Employees recognize them as giving more defense hardware for their tax dollar.

But reasons for the good reception are applicable to non-defense plants, too. N/C has offered job improvement to some machinists, improved or upgraded maintenance skills, and created a lower cost product—permitting Boeing to compete for more business.

Reception on the shop floor is mixed. When the man on the Milwaukee-matic was questioned, he confessed he would rather work on conventional machines. He felt he was not using his skills on this one. They had been transferred to tape. His feeling of craftsmanship was being eroded. But he had no complaints about increased load because Boeing believes it's best to keep one man on each N/C machine.

It is theoretically possible to double machines on an operator, but the scheduling problem with tapes of different length would be enormous. With one man on each machine, the spare table can always be ready for shifting into the work position; the machine keeps running all the time.

In case of machine trouble, Boeing also likes to have an experienced man always available as good insurance on an expensive piece of equipment. For this reason it prefers not to put high school graduates with only 4 weeks' training on the machines.

One thing that may not receive immediate acceptance is a different way of looking at costs. In order to take full advantage of the capabilities of these machines, it may be more economical to scrap existing tooling and build new tooling for the N/C machine. Otherwise, the old tooling may limit the productivity of the newer, faster N/C machine.

WHAT IS THE FUTURE OF N/C?

A whole new technique of mathematical dimensioning will come into the design field. Converting dimensioned parts to coordinate dimensions for computer programing now wastes 50% of drafting hours.

Increased accuracy of the new machines will have two main effects. Rejected or reworked parts will be fewer, less hand finishing will be required, and there will be less need for quality inspectors. Also, with increased accuracy, machining will more closely approach the designers' optimum.

Revised designing. All engineered surfaces must be mathematically definable. French curve matching will not do for accurate N/C machining. Models and templates may be replaced by mathematical calculations.

New programs for computer assistance. Such things as the ability to make a tape for mating dies through instruction for only one side will be possible.

New machining centers. Small companies unable to buy N/C machines will support a multi-purpose tool, privately owned—like Mil-A-Matic Machining Company (Santa Ana, Calif.) or Numerical Machining Company (Cleveland)—or cooperatively owned.

More multi-purpose machine tools. Sunstrand's Omnimill is a recent one. Other manufacturers are following the lead of Kearney & Trecker's first Milwaukee-matic. Hughes Tool will soon be marketing its TR 3 multi-purpose machine tool.

COVER STORY

The men in the photo at right (and on the cover) play a key role in Texas Instruments' aim to beat competition. They manage the creation of automatic machines. It's their job to...

Mechanize to cut costs and raise quality

In 1959, U. S. transistor makers were selling "entertainment-quality" transistors (for radios and similar applications) at about $1.50 each. In the same year, near-hysteria hit some segments of the U. S. semiconductor industry when Japanese manufacturers sold over 2.5 million of these transistors in the U. S. at about 50¢ each. The year before they sold only 11,000. Sales in this country of foreign-made transistors are continuing to climb rapidly. The 1960 total was around 6 million.

The Semiconductor-Components Division of Texas Instruments, Inc. (Dallas) moved quickly in '59 to meet the Japanese price tag. It claims it has not been undersold since then by either foreign or domestic firms. Reason: mechanization of its manufacturing processes.

For the last three years it has pioneered in mechanizing the production of semiconductors. Other domestic manufacturers have automated assembly to some extent, but Texas Instruments (TI) is considered ahead of most. About 80% of its semiconductor manufacturing operations is now partially or fully automated.

FAILURES: ONLY ONE IN 250,000

The company is quick to point out that it has not mechanized production solely to meet foreign competition. Less than 10% of its total market is from the "entertainment" area. The bulk is from manufacturers of defense, industrial, and consumer products (e.g., dishwashers, disposals). These customers are constantly demanding increased reliability.

TI believes product reliability results alone justify the money and effort it has expended on mechanization. It reports that it has improved the composite reliability rating of some 800 types of semiconductors in the last two years from one failure every 2500 operating hours to one failure every 25,000 hours. It is shooting for a composite failure rate of only one in 250,000 hours in 1961.

"This is the primary reason for mechanization," says Frederick Stote, TI mechanization manager. "If you can design equipment that will automatically give uniformity of production, you eliminate the human error factor. This, in turn, improves product reliability, which is the main thing we are after." While Stote and others stress the reliability angle in discussing TI's mechanization program, it has obviously paid off in increased production and lower per-unit costs.

As a good example, TI announced in February that it was in mass production on two new ultra-fast-switching silicon transistors made by a new process known as epitaxial. (This type of transistor will be showing up in computers in the near future to give them much faster operation.) The concept of the epitaxial process was announced last year by Bell Laboratories, but the technology of putting the process into assembly-

AUTOMATIC TESTER (CAT) is continuous. It tests and classifies transistors 20 times faster than an operator can, checks itself once every cycle. A belt carries a jigful of transistors through 12 to 18 tests.

Mechanization projects at TI must improve production, reduce labor and material costs, increase reliability and uniformity of products. They're expected to pay off within two years.

line practice had still to be licked. TI has now mastered this, and is mass-producing the devices on mechanized assembly lines. At a time when competitors were bringing out small quantities of the devices at $125 each and up, TI put them on the market at prices close to those of older, more conventional transistors.

Mechanization, in this case, gave Stote and the company what they desired in the way of reliability. It also gave the sales department a terrific advantage over competitors in the way of price.

AUTOMATION LEVEL: 80%

A company like TI produces many types of semiconductor devices for different types of applications. Currently, there are over 2000 types of transistors alone on the market, each one with specific characteristics for particular applications.

Because of product complexity, no broad statements about "complete automation" can be made about TI's operation or that of any other firm in this industry. Some types of devices made by TI are in almost complete automatic production. Others are not. About 80% of its total manufacturing operations—from the growing of silicon crystals to the testing of finished devices—is currently mechanized.

"We like to think we are about 10 years ahead of the rest of the industry in mechanization," says Mechanization Manager Stote, whose title keynotes the significance TI places on automation. He has departmental head status, and his group of 600 is separate from all others at TI. Their job is to find a way to mechanize a particular function or system when they receive a request from one of the plant's product group heads.

The organization set-up of the Semiconductor-Components Division has three separate product groups under the general plant manager: germanium, silicon, and diodes and rectifiers. There is a manager of each group. Stote, as mechanization manager, is on a par with them.

EMPLOYEE RESISTANCE: THREE SOLUTIONS

TI believes it has adequately solved the problem of employee opposition to automation. Three practices are largely responsible:

1. Undoubtedly, the most important factor is an employee bonus plan. Each year, profits over a certain level are distributed to employees. Maximum bonus is a little over 14% of annual earnings; it has averaged about 12.5% for the last three years. The point is made that savings brought about by automation tend to enlarge the bonus pool.

2. The company has, as many others have, a work simplification program. Part of this program consists of briefing and training employees for their particular jobs, as well as helping them to prepare for better job classifications.

3. The company does not try to keep anything secret about mechanization from those who will be directly affected. They are brought in on plans almost from the beginning, and actually work with the mechanization team in setting up a new unit. The mechanization team, however, handles the unit until it has been "debugged," which usually takes about two weeks.

Meanwhile, the employee who has been supplanted by a mechanized device is shifted to another job. TI prides itself in that it has never had a layoff. When an employee is switched to another job, he or she takes no salary cut. Often, if training has provided the way, a shift may mean a salary increase.

TIMETABLE: 5 MONTHS PER PROJECT

In 1960, TI spent about $8-million on mechanizing its manufacturing processes. The program is a continuous one, so as much or more could be spent this year. The job is never finished in an industry where the evolution of product types occurs rapidly. TI does not try to mechanize everything for the sake of automation alone. It "tailor-makes" equipment to fit particular functions, and replaces this equipment as needed.

Almost all its mechanization projects start with a product manager. He maps out his problem and consults Stote, who in turn brings in his mechanization project engineer, R. E. Trueb. They work out a proposal on how to mechanize the function, including an artist's conception of the kind of equipment needed to do the job. They also estimate the cost of the project.

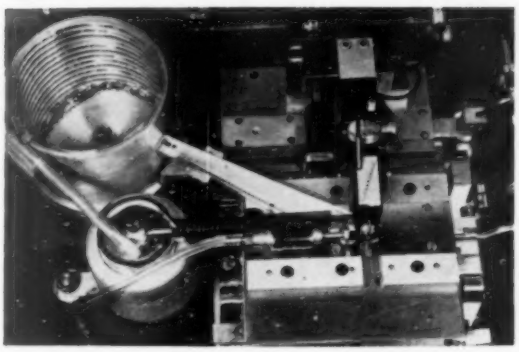
"In most cases," says Trueb, "we figure on three months for engineering and design, another two for equipment fabrication." Trueb's reference to equipment fabrication time illustrates one of the biggest problems semiconductor manufacturers have in mechanizing their operations. Seldom is there equipment on the market to fit the need. As Stote says, "When you need equipment nobody else has even thought of, you can't very well go out and buy it. You just have to make it yourself." At least 98% of TI's automatic equipment was designed and fabricated by the company.

Welder boosts productivity four times

This assembly-line operation requires the welding of lead wires to transistor headers as the devices near completion. Mistakes are more costly at this point. The operation used to be performed by hand under microscopes. With this machine, one operator can do the same work formerly done by four. The machine places and welds the wires automatically.

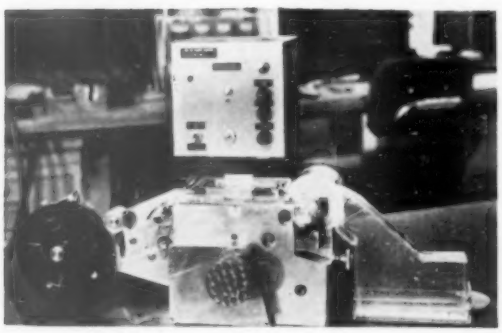
Sorts wafers 100 times faster

Before assembly transistor wafers are sorted for electrical characteristics. Machine automatically sorts 100 times faster than operators, more accurately.



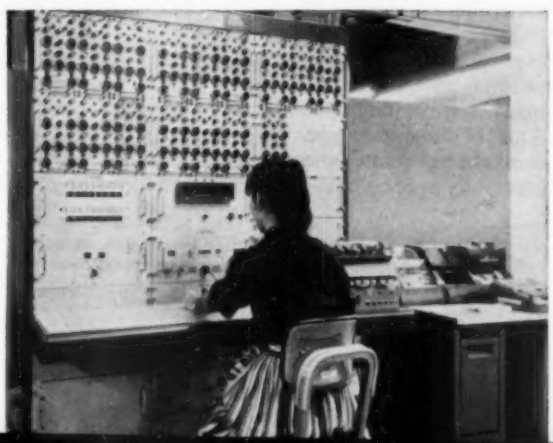
High-temperature oven ups output eight times

Main advantage of this new machine is its ability to hold a constant 150 degrees C. while work is processed through it. Operator inserts silicon units into the oven, which then performs assembly and test operations automatically. Old ovens needed eight times as many operators because they were alternately heated and cooled.



Forms rings at eight times old rate

Automatic ring former cuts a length of 6-mil aluminum wire from a coil and forms it into a tiny ring in one second. That's eight times faster than an operator used to make the rings under a microscope. Then she had to first wind wire onto a mandrel to form a coil, next remove the mandrel, and finally cut the coil into rings with a razor-sharp knife.



"Smart" is apt name for tester

Operator inserts transistors and observes operation of the "sequential mechanism for automatic recording and testing," or "smart" for short. It tests the transistors automatically and records data on punched cards for quality control analysis.

The story of a TROUBLE-FREE

Do you want a concrete floor free of cracks? One that doesn't dust? That's dry and almost wearproof? If so, here are the ingredients.

"WE WANT A TROUBLE-FREE FLOOR!" This sums up the floor specifications given us some three years ago by McGraw-Hill Publishing Company, Inc., in the design of its proposed 217,000-sq.-ft. warehouse and distribution center in Hightstown, N. J. Layout is shown in Fig. 1 at right.

"This floor is wonderful, sure fills the bill!" now boasts Gus Christie, general manager of the warehouse, after almost two years of punishing service. He has reason to know. The bumpy and wheel-grooved concrete floor at the old location in New York City was a continuous headache. It hampered movement of hydraulic skid jacks and four-wheeled shelf trucks used for stock handling. Often they couldn't be loaded to capacity. A bad jolt would spill books onto the floor, break bindings, mar pages. Steel plates were tried in the rough spots for a smoother ride, but these were costly to maintain, and presented a constant tripping hazard at loose edges. Dust from the floor created another serious spoilage problem. No amount of treatment seemed to cure it. Trucks and wheels took a beating, too.

These are the things McGraw-Hill wanted to avoid at the new location. It had learned that the extra cost for a good floor was justified. It knew that a trouble-free floor was the key element to efficient plant operation. So, in effect, it said: Build a good floor and put a roof over it—a floor that will withstand the pounding traffic of 3000-lb. fork-lift trucks handling palletized loads.

Cost of this complete floor, including grading, porous fill, and all other materials ran $1.46 per square foot. This included a premium of 10¢ per square foot for the special topping.

In view of the past history, it didn't seem appropriate to recommend another concrete floor. But we did. We knew that all concrete floor surfaces are not the same. Proper workmanship and technique can produce a surface with a built-in polish and a hardness that is almost unbelievable. Also, the design of a floor must recognize many contributing factors that may affect the floor. Some of these are: type and intensity of loading; abrasion; control joints; unequal settlement; interruption of continuity as at columns, openings, and foundation walls

By PHILIP M. GRENNAN, P.E., Engineer-Associate, Office of Alfred Easton Poor, Architects, New York

A BENEATH-THE-SURFACE

Fig. 1

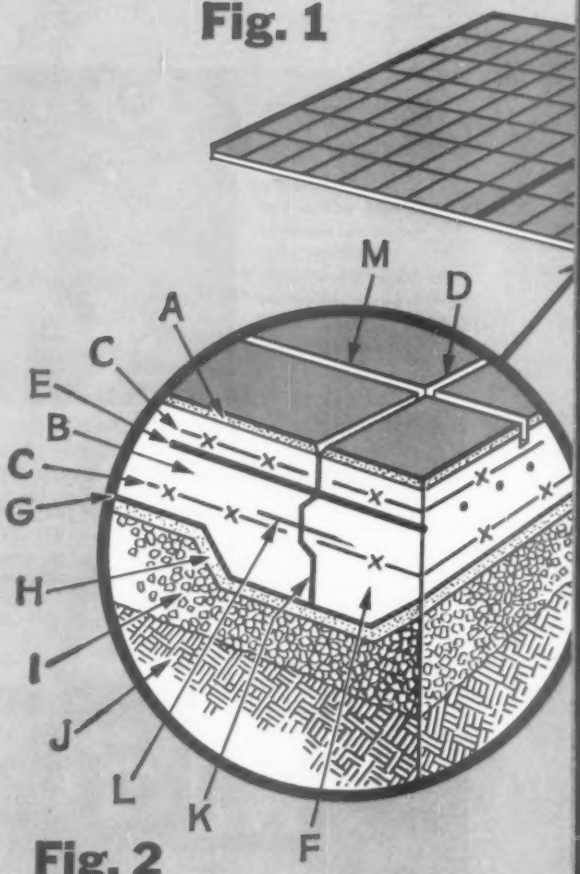


Fig. 2

Fig. 1—Floor plan

CODE TO FLOOR DESIGN

A. 1-in. heavy-duty densified concrete topping
B. 5-in. base slab
C. Welded wire mesh in two layers
D. Tooled joint
E. Steel reinforced dowels
F. Thickened slab (to give key added shear strength)

FLOOR—its design and realization

VIEW OF A TOPNOTCH CONCRETE FLOOR

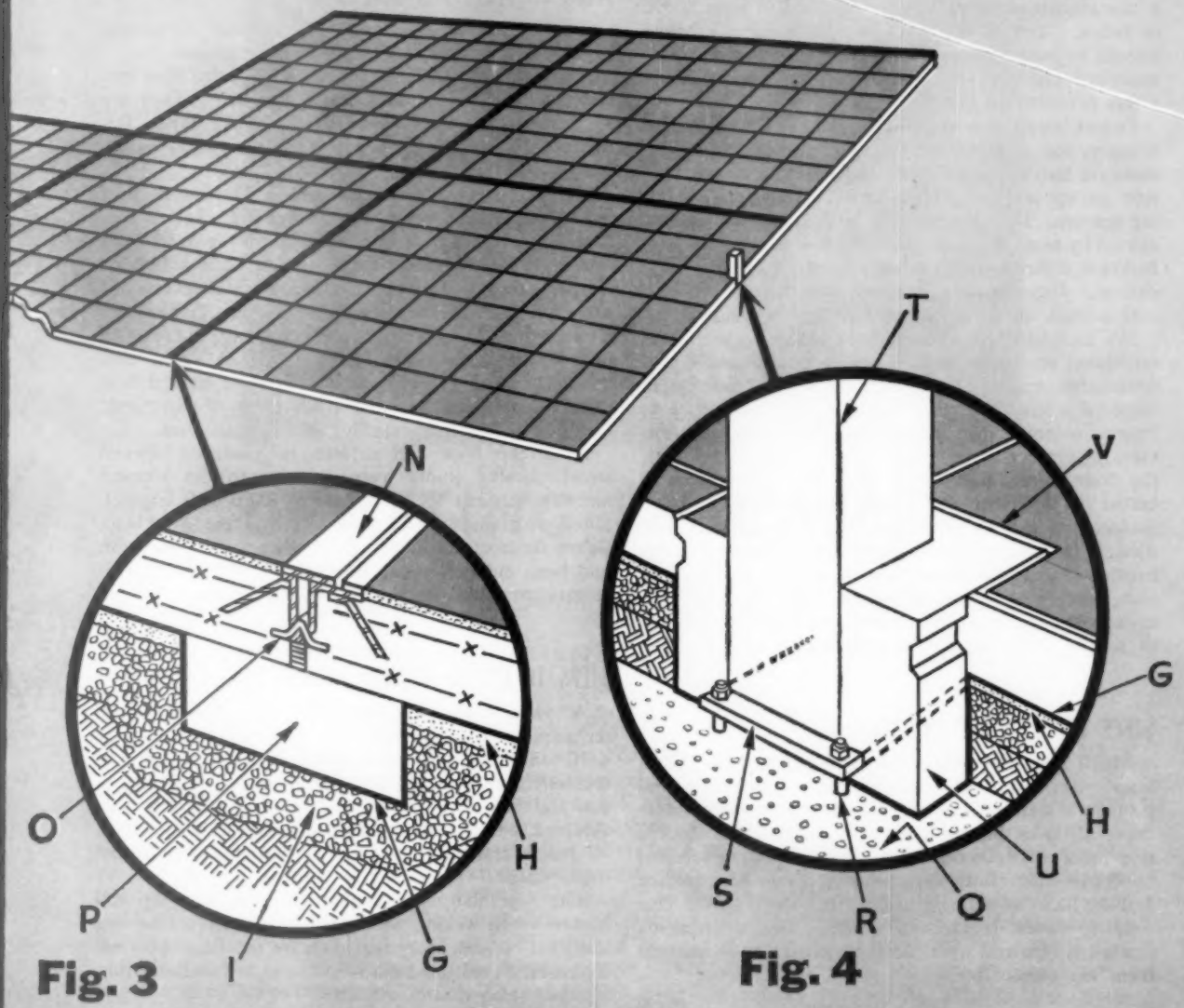


Fig. 3

Fig. 4

Fig. 2—Construction joint

Fig. 3—Expansion joint

Fig. 4—Column joint

G. 6-mil polyethylene moisture barrier
H. 1-in. layer of sand
I. Crushed stone
J. Undisturbed ground or backfill
K. Keyed construction joint
L. Galvanized water stop
M. Sawed stress-relieving joint
N. Expansion joint
O. Copper water stop
P. Concrete impact block
Q. Column footing
R. Anchor bolt in column footing
S. Base plate (under column)
T. Precast column
U. Concrete poured around column
V. Construction joint all around column

or grade beams. So we were sure we could produce a floor that would be permanently non-dusting, level, smooth, and free of any water seepage. This latter specification was an extra challenge because the Hightstown floor would cover 5 full acres atop a water table whose normal level is only 11 feet below the surface.

To produce the working surface required, we designed a floor of many adjectives: compacted, cushioned, waterproofed, drained, reinforced, interlocked, segmented. It can absorb whatever stresses are applied from above or below. And, if necessary, it will transmit extreme stresses to predetermined lines where they can be harmlessly relieved. In short, cracks should not occur except where permitted at joints.

Proper installation was only secondary to good design. Usually, the steps of grading, compaction, stone fill, moisture barrier, rough slab, and concrete topping are split among several subcontractors, mainly for scheduling reasons. But since defects in floor topping can be caused by many things below it, such a split-up program makes it difficult to pin down responsibility for visible defects. The complete contract was therefore placed with a single subcontractor specializing in this field.

We took other precautions. Construction work was scheduled so that column footings, grade beams, and foundation walls had the bulk of their dead weight imposed at least one month before the floor work began. Precast columns were set in place, surrounded by concrete to protect anchor bolts, Fig. 4 (page 75). Thus, the foundations had taken most of their settlement before the floor slab was placed. Purpose was to avoid surface cracks. Often when floors are quickly tied directly or indirectly to the foundations, unequal settlement will cause concentration of stresses in the floor slab, leading to unwanted cracks. Note also the concrete base (P, Fig. 3), which prevents deflection of edge of section under a concentrated load.

STEPS TO DUST-FREE SURFACE

Much depends on the installation procedure. Soon after placement, the concrete mix is densified and brought to a low water content by the extraction of water required up to this point for workability. This absorption process is followed by mechanical compaction and hand troweling. Both steps produce a very hard surface and the hand troweling also imparts a slight gloss. This topping never requires a sealer. The non-dusting feature is obtained by achieving the maximum strength from the cement binder.

STEPS TO WATERPROOFING

Before the base slab was poured, a moisture barrier was laid on the compacted sand. It consisted of a 6-mil thickness of polyethylene membrane. This membrane was lapped at joinings, and made continuous with previously installed membrane around all column pedestals and at foundation walls (see G in Figs. 2, 3, and 4).

Horizontal metal water stops were embedded in the base slab beneath all joints. Since expansion joints are most susceptible to water seepage, copper water stops of 20-oz. cornice temper, commercial grade, were used here (O, Fig. 3). Construction and stress-relieving joints are guarded by 20-ga. iron sheets galvanized to ASTM specification A-93-55-T (L, Fig. 2).

STEPS TO FORESTALL CRACKS

Three types of floor joints were used: expansion, keyed construction, and stress-relieving groove.

Expansion joints (Fig. 3) separate the huge floor into five distinct sections, each about one acre. They are the conventional over-lapping metal-plate type. Between sections, these joints provide for lateral movement caused by changes in temperature.

The keyed construction joints (Fig. 2) make each of the five sections a single interlocking unit. This is true despite the fact that 56 concrete pours were needed for each section (28 each for base slab and topping, bonded to each other). The pours were done in checkerboard pattern to alleviate the effects of shrinkage. To facilitate construction, the welded wire mesh was not carried through the construction joints. Instead, reinforcing dowels (E, Fig. 2) were embedded in the base slab at these places. They have half the strength of wire mesh, thus creating a stress-relieving line at each joint.

After the floor had sufficiently hardened, special stress-relieving joints were sawed into the topping midway between the construction joints (M, Fig. 2). Slits were made at least 1 inch deep, and filled with lead. Below these special joints every other wire in the mesh had been cut before the base slab was poured. This feature provided added stress-relieving lines.

STEPS TO INSURE A SOLID FOUNDATION

A variety of stress-resistant and stress-relieving techniques were employed. The soil was compacted by a 10-ton roller until no visible movement in front of the roller was evident. The 5-in. base course of aggregate and the 1-in. layer of sand were likewise compacted. Coupled with the scheduling of footings, this precluded all but a fraction of whatever differential settlement might ensue.

The 5-in. slab was double-reinforced, near top and bottom, with welded wire mesh. This reinforcing was designed for the operating loads on the floor, possible hydrostatic pressure from below, and to handle shrinkage and temperature stresses.

Says Gus Christie of the Hightstown floor: "The more traffic we put on it, the harder it appears. There's absolutely no dusting needed. Polishing would only make it slippery. Our floor is really trouble-free."

John Lowry, Inc., of New York City was the general contractor of this warehouse and distribution center. The Kalman Floor Company, also of New York City, was the subcontractor for all the floor work.

DRAFTING BY CAMERA

Each time the operator presses a key, the camera photographs sophisticated electrical symbols.

The job of drafting finished wiring diagrams has been cut 75% at Reliance Electric and Engineering Company, Cleveland. This photographic composing machine with a 114-button keyboard does the job faster and neater than a skilled draftsman. Cost: $31,500 installed.

Basically, the Fotosetter is a photo-drafting device using brass key matrices similar to a linotype machine. But, instead of an alphabet mold at the end, the matrices have a negative of an electrical symbol or letter embedded in their sides. Thus, the Fotosetter turns out a series of photos—black-line images on transparent positive film—of the complete line wire diagram, rather than slugs of lead type.

The machine can draw matrices from two magazines at a time, giving the operator 228 symbols at his fingertips. In addition, matrices of uncommon symbols are kept nearby and can be hand-inserted. Symbols include everything from rheostats to pushbuttons. All matrices are automatically returned to their place in magazines or trays after use.

An engineer first makes a freehand sketch of the basic circuit design on indexed cross-sectioned paper as a reference for the operator.

In composing, the operator chooses from eight lenses to get the right drawing size. This ranges from ½ inch to 1⅔ inches. As each line of the diagram is composed, a high-speed camera photographs it on a 30-ft. roll of film. Adjacent matrices overlap slightly so there is no gap on the drawing. Up to 40 characters can be used in each diagram line.

After the diagram is complete, the film is removed and developed in an adjoining darkroom. Errors can be corrected by typing the correct symbols on the Fotosetter and stripping them onto the positive film.

The finished diagrams are cemented to standardized drawing sheets with numbered margins and printed legends. This saves time, makes filing convenient, and allows conventional copies to be made.

Since the negative in each matrix is a reduced photograph of a carefully drawn symbol or letter, a clear, sharp diagram is ensured.

The Fotosetter is made by Intertype Company, New York.

New life for old batteries

Recharging flashlight cells used by maintenance and production workers is almost a forgotten art. But it could be a quick way to save several hundred dollars a year.

In its August 1960 issue, FACTORY published in its Case Book (page 158) a short story on how Lockheed Aircraft Company (Marietta, Ga.) was saving $200 a month by recharging flashlight dry cells over and over again.

Evidently, many plant people didn't realize this was possible. The article brought in correspondence and calls asking for more details. The tone of some of the inquiries indicated complete skepticism. So we rechecked the details with Lockheed's plant engineering staff and found the published story was accurate. Lockheed said it also had received numerous inquiries.

What is surprising is that plant maintenance people have forgotten, or never knew, that dry-cell recharging was commonly used to offset shortages during World War II. For various reasons, the practice was generally dropped. Yet today's batteries are better adapted to recycling than those of 20 years ago.

Because the idea offered potential savings to many FACTORY readers, we spot-checked 16 large and medium-sized plants—none of them were practicing recharging. Yet we found big utilities with equivalent maintenance and inspection usage of flashlights who reported they had been saving substantial amounts of money for years by recharging on a routine basis. We talked to battery manufacturers, and studied everything we could find that had been published on the subject.

From these sources, there is lots of evidence that if your plant purchases more than 250 cells a month for flashlight use, recharging could cut your net battery costs in half or better. Many batteries, for example, can be recharged four, five, and six times. (Lockheed has some that have been in service since 1954.) *But there are several "ifs."* Before you give the idea a brush-off, or plunge ahead, read the full story as it follows here.

LOOKING AT THE THEORY

If you've ever had a leaky one, you know a "dry cell" isn't dry. It's soaking wet inside, but reasonably well sealed to prevent the loss of moisture. The electrochemical reaction in which the zinc case is consumed by the electrolyte to produce electricity is a reversible process. If you reverse the electron flow by recharging, the zinc is redeposited on the inside of the case. Under controlled charge and discharge rates, one laboratory was able to draw 4½ times as much energy from a group of dry cells as would have been possible if all the zinc had been completely used up. When the cells were cut apart after the test, the zinc cases were smooth inside and of full thickness.

The most authentic statement on recharging is found in U. S. National Bureau of Standards Publication LC 965. Here's what it says:

"Although the dry cell is nomi-

nally considered a primary battery, it may be recharged for a limited number of cycles under certain conditions. Briefly these are:

- The operating voltage on discharge should not be below 1.0 volt per cell when battery is removed from service for charging.
- The battery should be placed on charge very soon after removal.
- Recharge ampere-hours should be 120% to 180% of the discharge ampere-hours.
- Charging rate should be low enough to distribute the recharge over 12-16 hours.
- Cells must be put into service soon after charging as the recharged cells have poor shelf life."

The firms that are making recharging pay off put it this way: "*If* you use enough batteries, *if* you run them down fast enough, and *if* you can keep labor costs in the collecting, recharging, and redistributing process down to a few cents per battery, it pays off very well."

One thing you don't have to worry about is the cost of the power involved. You pay from $400 to $800 per kwhr. for the energy you use in a typical flashlight battery. At a plant kwhr. cost of 1¢, under the worst kind of recharging efficiency, you'll still be getting a 99.9% + reduction in the cost of your battery energy.

SETTING UP A PROGRAM

Under a battery recharging program, five steps are involved: collecting, checking, charging, rechecking, and disbursement. Disbursement takes the same amount of storeroom time whether new or recharged batteries are handled. Collection of old batteries is also necessary if you want to prevent employees from appropriating batteries for home use. In fact, starting a recharging program can serve as a good reason for getting battery disbursement under control, if it's not already.

So the only increments of added labor are those of checking, charging, and rechecking the batteries. Because cells must be checked individually, and because the total per-cell handling cost must be cut to a few cents, it is important that the charging procedure be free of waste motion and simple. (Commonwealth Edison Company, Chicago, charges and tests batteries in pairs.)

BUILDING A CHARGER

The diagram shows a simple circuit for charging. None of the values listed for the components are critical. Most users build up chargers out of equipment lying around the maintenance shop. Only a few points are important.

1. Throw out batteries that show any signs of leakage or swelling. It's better to set acceptance limit (i.e., minimum voltage reading) for rechargeable batteries high and reduce it later if advisable.

2. Use battery connection methods that are fast, simple, positive. Lockheed stacks 12 batteries at a time in 27-in.-long, open tubes (see photo. When loaded, tubes are clipped onto charging rack. Operator can load several dozen batteries in a few minutes.

3. The transformer can be eliminated and current limited by the variable resistor, but operator safety is endangered unless batteries and connections are inaccessible while the charger is turned on.

4. Reported charging rates vary widely. Upper limit is set by battery heating. Excessive rate can cause batteries to explode. Low rate causes no problem, but ties up batteries that could be in use.

5. Battery voltage should be tested under normal load, not under short circuit. The latter gives no meaningful indication of battery quality or capacity. The 2¼-ohm. load resistance in the diagram is used by battery manufacturers to correspond to the equivalent load of a 2-cell flashlight lamp.

6. Don't use freshly charged cells on electron tube or other over-voltage-sensitive equipment. Cell voltage may be up to 50% above normal for the first few minutes.

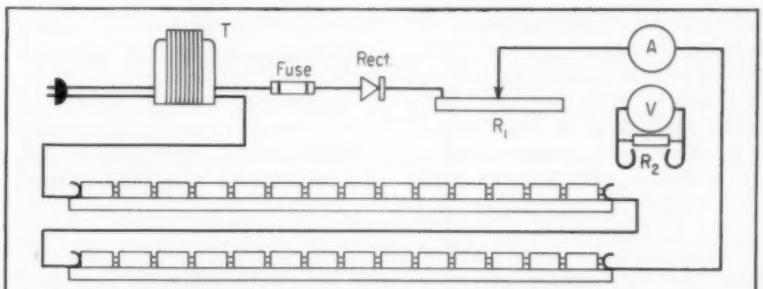
7. Recharging of lantern batteries is even more attractive because the per-battery labor cost remains the same. Current can be proportionately higher.

What makes battery recharging particularly economical is that a flashlight normally utilizes only the first third of the total energy in the battery. With a recharging program, flashlight batteries are used over the range of their most efficient light output. Batteries are changed without hesitation because they don't have to be scrapped.

To get the most from your battery dollar, keep the following points in mind. Cell life deteriorates rapidly when storage temperatures are high, so batteries should be stored in the coolest, driest place in the storeroom. Be sure that your stockroom store dispenses oldest stock first and that purchasing is done in quantities small enough to keep stocks fresh.

Another point (and one you've probably suspected from experience) is that batteries run longer when the load is intermittent. For instance, a typical cell delivers over twice as many usable watt-hours if the load cycle is 4 hours a day rather than 24 hours. A general principle is that total available energy increases as cycle decreases.

Finally, while studying plant battery costs you may find your usage is heavy enough to justify rechargeable wet-type industrial flashlight batteries. They're more expensive initially, but they're good for hundreds of charging cycles.


T
Fuse
Rect.
A
V
R_1
R_2
T - Transformer - primary 120 v, secondary v - approx 3 X no of batteries
Rect. - 300 v, 3A diode or metallic rectifier
R_1 - Variable resistor - approx 50 ohms, 25 w
A - 0 to 3 ammeter
V - Panel mount 0 to 3 voltmeter with attached test clips
R_2 - Load resistance - 2¼ ohms, 1 watt

CIRCUIT SIMPLICITY is obvious in this diagram of a typical flashlight battery recharger. Since component ratings aren't critical, spare parts can be used.

Is your plant doing a good job of controlling production and inventories? Your answers, as well as those of 387 other plants, are to be found in FACTORY's . . .

Exclusive survey of production and inventory control

To update its two-year-old manufacturing audit (December 1959, page 50), FACTORY editors turned to members of the American Production and Inventory Control Society (APICS). Information from these 453 men, professionally interested in this plant function, offers you new yardsticks for evaluating your own plant.

But don't be surprised by some of the answers. Of 387 plants covered, over 25% still regard inventory control not as a distinct department, but as a group of methods used by anyone from plant manager to department foreman.

Plants with APICS members still have opportunities for improvement, too. Few do long-range forecasting, most restrict it to one year. Processing information is still a manual chore. New mathematical techniques are restricted; only half use ABC inventory control; less than a fourth use operations research (OR); less than a third employ economic order quantity (EOQ).

This failure to rush headlong into new methods stems partly from lack of management support. Many departments cry for attention: 70% feel they are operating under hazy production and inventory policies; 30% have either unsatisfactory or no job descriptions.

Management also shares part of the blame for the lack of customer orientation in P&IC departments. Though most recognize the customer's right to be notified of delays affecting his deliveries, 17% admit they don't. Another 20% feel their system is unsatisfactory.

But progress is being made—perhaps through interest created by APICS prodding. More efficient control methods are being used. Manual processing of information is yielding to tabulating equipment and computers. In the two years since FACTORY's manufacturing audit, use of computers for P&IC has increased over 80%. More groups are adopting mathematical techniques as strong guides for personal judgments —still the most important factor in setting production output and inventory levels.

Greater education and work experience of men in the field helps, too. And the opportunity for over 50% of these men to communicate directly with top management is calling attention to improving this important manufacturing service.

This FACTORY survey was done with the cooperation of members of the American Production and Inventory Control Society. Special mention should be made of the coding assistance from Mrs. Rita Deschambeau and Bob Mayer of APICS Chicago office. Also of the tabulation and decoding ably done by Dr. Clifford Baumback and his staff of the Bureau of Business and Economic Research, State University of Iowa, Iowa City.

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P&IC, although a small department, still requires the close and careful attention of top management.

To see how you stack up, study this first chart. No matter what the plant size, the same average % of people are required in P&IC—about 3½%. But it ranges between 1 and 10%. As plant size grows, the range shrinks to a maximum of 6%. One large plant has less than 1%.

As shown by the center chart, 80% of the plants measure effectiveness of inventory management. But 14% pay no attention to it. From keeping a close count of dollars invested in materials to computing return on inventory investment, good managers know how well inventory is being controlled. Inventory turnover is also used.

A smaller number (72%) keep an eye on production control. Comparison of actual with planned production is widely used. Overtime paid to hourly workers is next in popularity. Ratio of machine utilization to capacity is least used.

Surprising is the small number of plants (only 62%) concerned with meeting promised delivery dates. Apparently, customer service is a philosophy that has not yet soaked into 38% of P&IC departments.

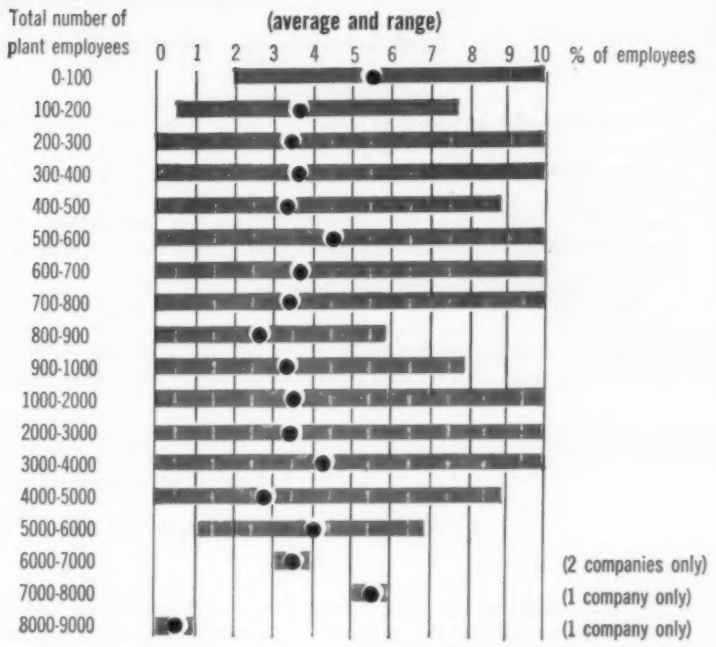
The biggest factor in planning final production is the sales forecast (bottom chart). But it is not the only one. The opinion of many executives who carefully consider company financial condition, employment levels, and seasonal fluctuations remove over-all planning from the P&IC department.

Few plants rely heavily on linear programing or other mathematical techniques, although these assume greater importance in setting inventory levels. Inventory turnover is a large factor in establishing levels of raw materials and in controlling finished goods inventory. Work in process still depends heavily on sales expectations.

A surprising discovery of the survey, related to inventory control, is the unexpected number (over 40%) of plants not using the well-recognized ABC classification of raw materials and supplies.

Turn the page

How many people do you need in Production and Inventory Control?



Are you measuring effectiveness of...		% of plants	How?	% using
inventory control?	Yes	80	Inventory turnover	86
	No	14	Dollar investment	89
	No answer	6	Return on investment	41
			Obsolescence	60
			Surplus	56
production control?	Yes	72	Actual vs. planned	90
	No	17	Overtime (hourly workers)	75
	No answer	11	Machine utilization	39

What determines production output? ...and inventory levels?

This method	In these plants	Of raw materials	Of work in process	Of finished goods
Executive opinion	171	94	82	140
Over-all financial considerations	153	164	116	172
Employment level and seasonal fluctuations	156	44	82	109
Production plan related to:				
Over-all sales forecast	191	96	90	136
Details in sales forecast	160	100	107	140
Total plant load by applying re-order point on EOQ for each product	75	70	71	66
Optimum inventory calculation	63	69	50	64
Inventory turnover	83	106	80	117
Linear programing	23	13	16	13
Other calculations	12	7	8	8
Other methods	23	19	19	11

Few plants surveyed make full use of all techniques and inventories. Most of them depend on one specific technique for

Determining the production order (quantity and timing): Review or opinion is relied upon in most cases (33%). Next most used is re-order point, or re-order point with EOQ. Surprisingly few depend on some variation of EOQ. (See chart, right.)

Specifying methods and materials: In 44% of the plants, sequence of operations determines this. Bill of materials is used for shop orders by 33%. The same proportion rely on process specifications for routing the traveling work sheet and for determining shop orders.

Detailed scheduling: For short production runs, straight-line scheduling (one operation completed before starting the next) is preferred three to one over an overlapping schedule. But this is reversed for long production runs, when 53% of the plants start a second operation before completing the first.

Loading machines: Time standards adjusted for incentive pace and downtime are used in 45% of the plants. Historical averages help in 22%. But estimates from industrial engineers are used in only 15%, educated guesses by P&IC 12% of the time. Some mathematical methods are used by 30% in loading.

Scheduling production within the plant and maintaining of P&IC. Other responsibilities, such as make-or-buy decisions and

This analytical chart (at right) shows how widespread are the responsibilities of some production and inventory control departments. Basic to most are: setting inventory levels, scheduling production of material through the plant, dispatching production orders, and some control over raw materials. Responsibilities break into specifics beyond these general areas.

In many cases, they overlap with other departments. Take the general area of production planning. In no case did more than 50% of the P&IC departments assume responsibility for sales forecasting, plant capacity studies, or release of new products. Only 18% authorized tooling for new products. The biggest responsibility (77%) in production planning was determining levels of production.

Customer service is another shared area, this time with the sales manager or a separate customer service department. Yet one of the surprising findings of this survey is that marketing-oriented responsibilities are claimed by almost half of the P&IC groups.

Routing of purchased goods and plant shipments is usually regarded as in the traffic department's bailiwick, or in purchasing's. But 25% of the plants assign it to P&IC. Even make-or-buy decisions are claimed by 37% of P&IC departments as their primary responsibility.

In what might appear to be a prime function of this group—control of raw material inventory—30% of the P&IC groups disclaim responsibility. In inventory control of operating supplies—usually assigned to purchasing—47% claim no responsibility. Control of operating supplies is split between purchas-

WHO ANSWERED THIS SURVEY?

Type industries	No. plants	%
Heavy processing	26	7
Light processing	57	15
Heavy assembly	48	12
Light assembly	155	40
Benchwork assembly	36	9
Other fabrication	65	17
Total	387	100

Size of plants	No. plants	%
Under 200	48	12
200 - 500	104	27
500 - 1000	101	26
1000 - 2000	46	12
2000 - 3000	30	8
3000 - 5000	20	5
Over 5000	9	3
Not identified	29	7
Total	387	100

Answers came from members of a new (4-year-old) professional society—American Production and Inventory Control Society. Out of APICS's 1500 membership, replies were received by FACTORY from 453 members, representing 387 U. S. plants. What kind of person is sharing with you his opinion and experience on the fine points of controlling inventories and production? A typical member might be:

- A "production and control manager."
- From 30 to 40 years old.

for controlling production performing these functions:

Controlling raw material inventories: Only 48% of the plants use the ABC method of classifying and controlling raw materials and supplies. In 70%, raw material inventories are calculated by adjusting for upsets caused from abnormal use or abnormal deliveries during the lead time. Only 20% of the plants use a mathematical formula based on normal distribution of probability.

inventories are the hard core customer service, are shared.

ing, plant manager, department foremen, and chief storekeeper.

This confused picture on inventory responsibilities may stem from 27% not having a separate inventory control department. In these plants, responsibility for inventory control is spread from the controller's office to department foremen.

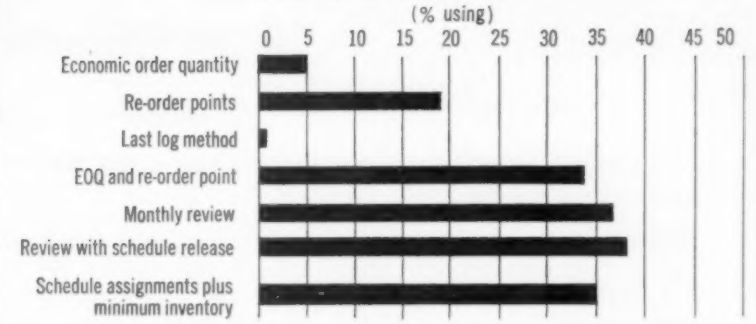
Not all plants are organized in the same way, either. In 60%, a P&IC manager reports to a plant manager. In 25%, production and materials control supervisors report to a production manager. Remaining 11% split responsibilities.

Turn the page

- A college graduate, probably in science or engineering.
- Reporting to the plant or production manager.
- Experienced in P&IC for 1-10 years, with a background in production, engineering, or sales.
- Working in a plant of fewer than 1000 employees.
- Employed by a company with three or fewer plants, probably involved in light assembly work.
- Living in one of the northeast states.

What methods are used for calculating orders for raw materials?

(quantities and frequencies)



What are major responsibilities of P&IC?

Activity	Responsible (%)	Others also responsible	(%)
Production planning			
Levels of production	77	Production manager	8
Plant capacity studies	50	Chief industrial engineer	15
Release new products for production	50	Chief product engineer	24
Participate in sales forecast	**35**	Sales manager	**36**
Authorize new product tooling	**18**	Chief industrial engineer	**24**
Levels of inventories for:			
Work in process	88	Plant manager	3
Production materials	81	Procurement	5
Finished goods	70	Sales manager	9
Decide to manufacture new products	**25**	Top management	11
Customer service			
Delivery schedules	76	Sales manager	10
Delivery promises	76	" "	11
Answers for customer follow-ups	**48**	" "	28
Order records	**46**	" "	26
Instructions to ship	**44**	" "	28
Shipping department			
Control of physical quantities of finished goods	**65**	Shipping foreman	5
Traffic			
Routing shipments	**27**	Traffic department	**36**
Routing purchased goods	**23**	Procurement	**32**
		Traffic	**26**
Production control			
Product routing	55	Chief industrial engineer	9
Make-or-buy decisions	**37**	Chief product engineer	11
Production orders			
Preparation and issue	91	Production manager	1
Order frequency (no. of runs)	90	Plant manager	1
Quantity determination	90	Sales manager	2
Scheduling product through factory	87	Plant manager	2
Estimating manufacturing lead time	87	Production manager	2
Machine loading scheduled products	77	" "	3
Scrap allowances	68	Chief product engineer	3
Dispatching			
Schedules and instructions	91	Production manager	2
Follow-up reporting	87	" "	2
Expediting in plant	87	" "	2
Control quantity of work-in-process	82	Plant manager	5
Intra-plant traffic	66	" "	3
Controlling raw material inventories			
Control quantity of production material	78	Procurement director	7
Placing purchase requisition	77	" "	11
Record keeping	75	" "	9
Determine item inventory level	75	" "	9
Determine order frequency	73	" "	14
Determine inventory reserves	71	" "	10
Determine order quantity	70	" "	16
Control operating supplies inventory	53	" "	10
" " " " quanties	48	" "	11
Determine purchase lead time	**36**	" "	**51**

Interrupting production results in costs ranging from the highest costs are in the assembly of heavy equipment—

Of benchwork assembly plants, 38% report set-up costs are over $500; half of those assembling electronic equipment figure on over $500 each time production is interrupted.

Surprising were the much lower costs reported in heavy processing, particularly in primary metal products. Over 60% allow less than $100 for each interruption. (This may be due to a different interpretation of "set-up costs.")

Of those plants answering FACTORY's survey, a third indicated they had no interruption costs. Since they are engaged in continuous production, the question did not apply to them. This eliminates from this table the cost of drastic interruptions in a continuous process, thereby shifting the emphasis to those plants experiencing lower costs for minor set-ups. (It is only coincidental that the 260 plants submitting cost figures manufacture a total of 387 different products.)

For heavy processing plants, the average set-up cost is below $100. For light processing plants, it's about the same. But heavy assembly of transportation equipment, electrical machinery, farm equipment, and earth-moving equipment is concentrated at the high end: over 72% of plants in these fields have set-up costs over $500. Large equipment plants less subject to frequent design changes are lower; machine tool plants report less than $100.

Light machinery and electrical products, involving the assembly of components, also average less than $100. But even here, 18 plants experience set-up costs over $500.

FACTORY's 1959 survey found the

Most plants still cling to the old system of processing of this, the use of data-processing equipment

Are data being processed efficiently? It depends on your viewpoint. Since FACTORY's survey two years ago, the use of tabulating equipment with punched cards has increased 30%. The use of computers has increased 100% in P&IC.

But as with all percentage comparisons, these hide low base figures. Less than 10% of all plants are using computers for controlling production orders and schedules. Only 5% use them for follow-up reporting on the progress of production schedules. In processing information on inventories, computers are used 10-15% of the time.

Punched cards and tabulating equipment are used to a greater extent—up to 34% in finished goods control and 24% in raw material and work in process. But in scheduling production, the use of tabulating equipment is again low.

Other mechanical or electronic tools find little use, either. Control boards are used by 11% for detailed production scheduling, but for little else. Edge-notched cards are used the least. And some even report that they have no method for processing information.

Scheduled dispatching is 70% centralized, with schedules going directly from production control to the foreman. Only 27% go through a chief dispatcher, who then releases them to department dispatchers.

Resistance to change is an old

under $25 to over $500. Here, and in electronics.

cost of interrupting benchwork assembly was low. But this year's survey discovered that six out of 12 plants assembling electronic equipment have set-up costs over $500. This is another indication of the growing complexity of military electronic equipment.

Lowest interruption costs, as might be expected, are in the paint industry (none above $50). The other lowest plants were those making machine tools, weldments, automotive dies, and stampings. None were above $100.

What does it cost to interrupt production?

In these fields...	Set-up costs fall into this % distribution					
	$0-25	$50	$100	$200	$300	$500 or more
Light assembly (Machinery, electrical, metal, consumer products)	34	29	11	7	6	15
Light processing (Glass, food, chemicals, drugs, rubber, etc.)	33	35	10	10	—	10
Heavy processing (Primary metals, pulp, basic chemicals)	38	29	14	5	5	5
Benchwork assembly (Electrical and mechanical instruments, electronics)	23	15	11	11	—	38
Heavy assembly (Transportation and farm equipment, machine tools, pressure vessels, heavy electrical)	20	13	10	5	8	44
Other fabrication (Textile, leather, publishing, paper, plastic, light metal products)	28	34	15	9	4	9

information by hand. In spite has doubled in two years.

story, one that affects even production and inventory control. But here it may stem from management inattention. As many as 21% have no formal organization, 27% have no adequate job descriptions, 51% have no formal training program for positions in their departments, 61% have no procedure manual—and 71% report that they operate their departments without clearly spelled-out policies for the management of production and inventories.

Turn the page

is information processed efficiently?

This information	...Is processed by this method (%)					
	Manually	Control boards	Edge-notched cards	Punched card tab. equipment	Computer	No method
Customer delivery schedules and order backlog	58	7	2	27	10	4
Production order:						
Quantity and timing	66	8	1	15	11	1
Preparation	67	3	2	15	8	2
Detail schedules for production department	69	11	1	11	5	7
Follow-up reporting of progress on schedules	68	7	1	14	5	4
Inventory records:						
Finished goods	56	1	1	34	15	1
Work in process	59	3	3	24	9	5
Raw materials	67	1	1	23	10	1

Good sales forecasting is still a matter of intuition—plants project only four months ahead, few beyond one year. If

Dependable sales forecasts still elude most plants. Even though basic information starts with the sales department, it seldom winds up unaltered as production orders. In between come many changes. Opinion of top executives, comparison with company's share of the market, a market analysis—all alter the original sales estimate, each one trying to outguess the consumer's chameleon-like decision.

Good sales forecasting is still a seat-of-the-pants area, most of it limited to less than four months in advance. About 40% try to extend it to a year. But few (17%) go out as far as five years.

From a majority of the plants (light assembly or fabrication) this is to be expected. But as the chart (at right) verifies, the longer the period of forecasting, the less intuitive it becomes. Statistics, rather than judgment, are more dependable on a long-range basis.

But no matter how much statistical methods or historical averages are consulted, final production plans come from someone's personal judgment. And not all figures receive the same judgment. Fewer than 20% place any faith in the customer's estimate. Most rely on information from their own sales departments. But even here 80% of the P&IC groups adjust this information in some manner before turning it into production plans.

One method of evaluating initial sales estimates is by charting historical averages. Adjustments for current orders or later information from the sales department is also used. A few plants use statistical smoothing techniques. Only 21 plants claim they use historical averages without some adjustment.

The use of operations research techniques is years. But many plants fail to use economic order quantity and

In examining more closely the use of operations research techniques, one encouraging note was heard. Even though less than 15% are using some OR techniques, other than economic order quantity, this is still more than FACTORY's previous survey uncovered in 1959.

But it's slow progress. Over three-fourths of the plants are not using known OR techniques. Methods such as the probability theory or queuing are seen in less than 4% of the plants. It is only EOQ that seems familiar to many P&IC people. But less than 40% use it for inventory control. Less than 30% use it for production control.

Where then lies the reason for failing to use these new tools? Partly with management. Only 23% have assigned someone the responsibility of using operations research in the plant, although some have assigned it to company headquarters.

Solid reasons for not adopting OR techniques are recognized. One plant reports it could not afford to spend $4000 to gather the information it needed in order to set up an

plus personal judgment. Many they do, statistics enter.

Correlation with economic indicators is another possibility. But the most widely used statistical method for evaluating sales estimates is analysis of business trends and cycles. Charting with control limits or comparison with a leading series (of economic indicators) is used only by a few to date.

Detailed production scheduling may also be a seat-of-the-pants art. Operations are scheduled by 55% of the plants only when large orders are in sight. On short runs, 55% plan on finishing one operation before beginning another one.

How are sales forecasts developed?

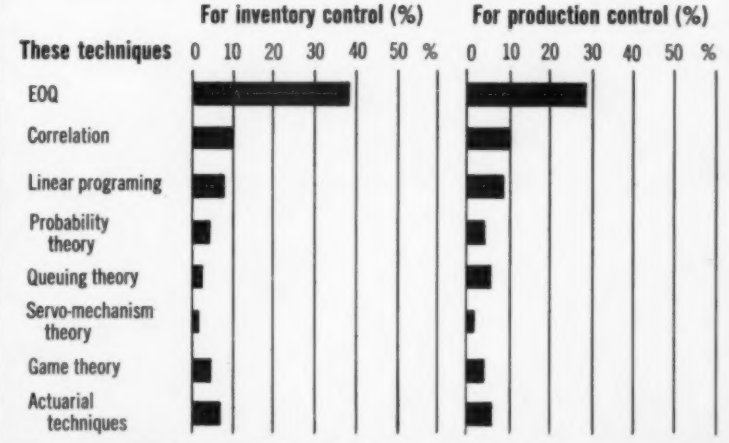
	Number of plants	For these time periods: 5-year	Annual	Quarterly	Monthly	Moving 12-month	Moving 3-month
By estimates from:							
Customers	81	6	63	27	38	15	27
Salesmen	118	15	96	50	45	20	25
Sales managers	186	49	163	71	70	31	34
Executives	150	65	135	42	51	20	32
Market analysis	119	61	104	36	35	21	26
Company's share of market	130	62	122	25	21	17	11
By statistical methods:							
Correlation with economic indicators	58	32	58	22	15	9	11
Trend and cycle analysis	69	27	49	22	33	24	20
Leading series	19	3	10	4	5	3	2
Charted control limits	34	17	17	11	23	7	16
By historical averages:							
Without adjustment	21	6	26	7	13	7	11
Adjusted for current demand of orders	104	10	51	50	73	19	39
Adjusted by latest sales information	138	21	84	66	91	26	36
Adjusted by statistical formula smoothing	33	5	23	13	16	19	15

increasing—up 10% in only two other helpful OR techniques.

economic order quantity system. Besides, its existing order quantity system operates satisfactorily.

Reluctance to adopt helpful new mathematical techniques stems from a feeling that this surrenders judgment to figures. But as anyone using these techniques knows, they are not a substitute but only a helpful guide when employed correctly.

How much are you using Operations Research techniques?



MEN, MONEY, AND PLANTS

The day after last year's Top Ten Plants were announced, the men you see at left (and some you don't see) began work on the Top Ten for 1961.

These FACTORY editors studied, analyzed, and tore apart where necessary the entry information offered by the several hundred seekers of this year's Top Plant honors. Buildings Editor Oz Stewart and other department editors traveled thousands of miles to visit the leading contenders.

Next month the whole business ends — and begins all over again.

In the May Top Ten issue you'll savor the fruits of these many-sided efforts.

In this one issue you'll find more ideas on improving methods and more ways to save money than you might have money to save.

Be certain to read about the Top Ten Plants of 1961. Your men, money, and plant will never be the same.

ECONOMY—the new frontier

The cost of quality control inspection represents a sizable chunk in many manufacturing budgets—maybe in yours. But how do you know if you are getting full value for every inspection dollar spent?

Sometimes inspection time may not be paying its way in defect removal, but may still be justified by the information it provides. For instance, it may motivate production workers or suppliers to maintain standards, or it may just assure that the facts behind management decisions are valid.

PROBLEMS	COMMENTS
1. How accurate are the inspectors?	A hurried, inattentive, or untrained inspector can go through the motions of his job without actually doing it. Too often no one is wiser and the bad material gets lost among the good. Management then must be able to determine whether or not the inspector's working pace, skill, equipment, and attitude are producing an accurate job.
2. Which factors are affecting inspector accuracy?	Inspection accuracy may depend on many factors: length of work week, work pace, quality of material being handled, or the processing methods. Unless the effects of each of these are understood, production changes may unwittingly affect quality.
3. How efficient is the inspection operation itself?	If inspectors have the job of removing defects, they can use one of two methods: 100% screening, or weeding out the worst lots by sampling. But no matter which is used, it invariably removes only a fraction of the defects that are present. In screening, efficiency and inspector accuracy go together. But in sampling, even though the inspector uses the plan accurately, the method may not be efficient.
4. How productive are the inspectors?	Inspectors are frequently higher-paid employees, paid both to inspect and make decisions. Because of this they should be productive as well as accurate. But time devoted to inspection aspects of the job may be low because of poor scheduling, improper work-place layout, insufficient tools, or lack of industriousness. The extent to which these factors crowd out inspection time should be known.
5. Do process control inspections actually control?	It is easy to establish process controls (i.e., a dimension or chemical property on a piece part) and then forget about it if the process runs well. But economical operation requires periodic review of controls.

By LEONARD KRANSER, Chief Inspector—Razor Division, Gillette Safety Razor Company, Boston

# of QUALITY CONTROL

In this case, inexpensive sampling or infrequent checking may be the most economical approach. But whatever the reason for quality inspection—whether for information or for defect removal—it should be, and can be, economically tenable.

To analyze its own inspection operations, Gillette Safety Razor Company, Boston, uses the following 10-point checklist. Now both top management and inspection supervision agree on what is an efficient, economical level of quality protection.

SOLUTIONS

Approval inspection is one answer. Samples of work passed by production inspection and samples of rejects are carefully re-inspected by separate approval inspectors. From this, the fraction of wrong decisions is calculated for each production inspector.

Examining regular production inspection records may uncover resistance to making rejections. In one case, an inspector did not record any breaking of torque measurements below the lower tolerance while the limit was marked on her chart. But when the tolerance line was removed, recorded measurements showed an occasional out-of-specification condition.

In another example, an inspector was instructed to take 25 pieces from a large lot and to reject for two visual defects. She frequently found one defect, but apparently hedged on calling two pieces bad.

We analyze the variability of inspection accuracy at Gillette through approval inspection data. We have determined how sharply accuracy declines with the quality of material coming to the inspectors, and use this knowledge when deciding whether to take defective material off the line. We are studying the relationship between accuracy and work pace as we look for more economical work methods and staffing levels. We analyze our approval data by time of day and day of week to find the periods requiring greatest supervisory vigilance, and determine whether or not overtime affects inspection accuracy.

For 100% inspection:

$$E = \frac{R}{R + RG}$$

Here E is efficiency, R is number of units rejected during a given period, RG is estimated number of rejectable units remaining in work passed as "good."

For sampling plans:

$$E = \frac{Pr \times Nr}{(Pr \times Nr) + (Pa \times Na)}$$

Here Pr is per cent defective in rejectable samples, Nr is number of pieces in rejected lots, Pa is per cent defective in acceptable samples, Na is number of pieces in accepted lots. This is for rejected lots scrapped, returned to vendor, or reworked 100%.

For sampling plans (rejected lots screened 100% for defective units):

$$E = \frac{R}{(Pr \times Nr) + (Pa \times Na)}$$

Evaluation of productivity varies with type of inspection. Repetitive inspection, at the end of an assembly line, can be time studied. One such analysis revealed that inspectors were inspecting far less than two-thirds of the time. In addition to personal time and delays, they were using 10% of the time to pick up work from the conveyor belt, 10% to adjust the item to the setting for inspection, and another 10% to package the work after inspection. Result: Work station and handling methods were revised to reduce non-inspection time.

Non-repetitive tasks, e.g., tasks of roving inspectors, can be studied by work sampling. This technique was used in a large screw machine department, which felt it needed more patrol inspectors. It was found that the inspectors then on the job spent only 50% of their time doing inspection. The rest was spent on walking, talking, writing results, collecting and cleaning samples, and so forth. As a result, the inspectors were placed at a work bench and a lower-paid runner was assigned to collect and clean samples and relay information.

Controls should be reviewed periodically to insure that inspection labor isn't being wasted. Also, the per cent defective found by each process check should be calculated at intervals. Those with good histories should be put on a once-a-day basis or dropped entirely, unless there is strong evidence that costly deterioration in quality can still occur with reasonable likelihood.

Turn the page

...PROBLEMS	COMMENTS
6. Are sampling plans rejecting material it would pay to accept?	Samples can be misleading. If there are only two bad parts in a thousand, some day an inspector will pull out these two in a sample of 20 and report 10% defects. This "producers' risk" is inherent in every sampling plan. But it should be tolerated only when quality is so poor that turning back a little good material with a substantial quantity of bad material is justified.
7. If material is rejected, is the cost-per-unit-removed justifiable?	Inspection is costly but justifiable when it weeds out enough defective material to save the cost of inspection. Each acceptance sampling plan or 100% inspection should be reviewed to find the cost-per-defect-removed. It should be known that more is not being spent on removing defects than it would cost eventually in rework, scrap, goodwill, or downtime.
8. Where sampling weeds out bad material, does it provide the lowest cost-per-defect-removed?	Sampling takes time—to select a truly random representative from a lot, inspect it, record the results, and make an acceptance-rejection decision. These costs are often inadequately considered in setting up a standard sampling plan such as published in Mil Standard 105B. Where the purpose of sampling is to remove bad material (not just to control quality level) the job may sometimes be done more economically another way.
9. How much scrap and rework comes from uninspected, controlled sources?	Despite careful control of dimensions at the production source, portions of the final products may be unacceptable. Parts may be produced to specifications, but they may subsequently be mishandled, damaged during finishing, dropped on the floor, soiled in storage, or mixed up in transit.
10. Which is more economical: to add or subtract inspection personnel?	If the size of the inspection staff has been stable, one of two conditions exists. Management believes it has the most economical balance between inspection costs and quality losses. Or management doubts that it has, but doesn't know in which direction the optimum lies. Probably the latter condition prevails.

EXAMPLE 1: FOR THREE MACHINING DEPARTMENTS, MONTHLY COSTS MIGHT BE:

Dept.	Inspection	Scrap in dept.	Subsequent operation Scrap and rework charged back
A	$200	$ 100	$1,000
B	500	100	50
C	400	1,800	300

In Department A, it appears more desirable to add inspection or inspection equipment. Perhaps inspection is overlooking a critical characteristic, or perhaps the inspection frequency is inadequate. In Department B, one might sooner try a cut in inspection than an increase. In Department C, there is clearly a need for more control; if possible, controls should be set up that would determine in advance when defects are about to be produced.

SOLUTIONS

Consider this example: 10,000 pieces come out of a plating operation containing only a small fraction (less than 1%) of stained or poorly plated parts. In the past year the fraction has never exceeded 1%. But if the entire load of pieces is rejected, it must be replated at a cost of $11.

When these parts go into assembly, any defective one will be noticed and can be replaced for $0.10. This means the breakeven point on quality is when cost of rejecting equals cost of accepting, or at a 1.1% rejection rate. Because the process always runs better than this breakeven point, it is folly to have an inspector assigned to acceptance sampling of the plated parts if fewer than 110 parts are bad.

In one case, inspection spent about $100 in three months sampling a small part. Two lots with samples of 75 were rejected: one of 110,000 pieces, with 9 defects and one of 175,000 pieces with 10 defects. Estimated number of defects removed is 36,500:

$$110{,}000 \times \frac{9}{75} + 175{,}000 \times \frac{10}{75} = 36{,}500$$

The cost per defect removed was:

$$\frac{\$100}{36{,}500} = \$0.0027$$

The economy of inspection in this case is illustrated by the fact that each defective piece creates approximately $0.10 in repair costs if it reaches the assembly line undetected.

In an actual example, two inspectors worked full time drawing 20-piece samples from boxes of 300 subassemblies, looking for boxes that contained enough defects to justify 100% screening by a third inspector. The number of defective units caught and removed from the work by this procedure was small. The cost per defect was high since the sampling inspectors spent considerable time handling boxes, emptying them, selecting good random samples, and evaluating sample results to decide between acceptance or screening. Analysis revealed that the three inspectors could weed out more defects if their supervisor assigned them as many boxes as they could screen completely during the day, and let the balance go by. The net amount of product purification increased, because the inspectors did more straight inspecting.

Estimates should be made as to the fraction of scrap and rework costs resulting from misoperation of planned processes and from "uninvited processes." Where the former is the cost-producing factor, more direct inspection may be necessary. Where an "uninvited process" is the source of trouble, indirect labor in the form of quality control technicians, process engineers, and more supervision may be needed. Sampling plans and control charts may reduce defects coming off the screw machine; a 100% screening device may be the only practical way to remove a small amount of damage resulting from material handling.

In the Razor Division at Gillette, we look at the balance between (1) inspection costs in a department, (2) scrap costs in the department, and (3) scrap and rework caused by defects leaving the department undetected and resulting in rejections at a later operation. The amount of scrap found at the responsible operation indicates the size of the prevention job to be done. Scrap allowed to reach later stages in manufacture shows the need for more efficient purification of work in process. (The examples below show how a comparison like this can be made.)

Another method is to assign demerits to types of outgoing defects in relation to their severity. The final inspection rejects can be scored as potential demerits that have been removed. Approval Inspection sample data on outgoing quality can be used to estimate the number of demerits that the final inspectors failed to remove.

EXAMPLE 2: FOR FINAL INSPECTION OPERATIONS, MONTHLY PERFORMANCE MIGHT BE:

Product	Inspection cost	Demerits removed by inspection	Cost per demerit removed	Demerits remaining in outgoing product
1	$1,200	100,000	$0.012	35,000
2	800	1,600	0.50	2,400

The inspection of Product 1 is removing demerits for considerably less than the $0.10-$0.25 that management is willing to pay. Probably it is economical to add inspection so as to remove more of the defects that remain in the product. In contrast, inspection of Product 2 is too costly, and also removes only a fraction of the demerits. This inspection should either be dropped or a method found for performing at a lower cost.

PAY RATES FOR KEY INDIRECT JOBS — IN 9 CITIES

All figures are average straight-time earnings in manufacturing industries except figures with asterisk, which are for **all** industries. They include incentive pay, if any, but **not** overtime, weekend holiday, or night-shift premium.

Weekly earnings are average salaries for standard work week.

	CLEVELAND, OHIO, SEPT. '60	GREEN BAY, WIS., AUG. '60	LITTLE ROCK, ARK., AUG. '60	MANCHESTER, N. H., AUG. '60	OKLAHOMA CITY, OKLA., AUG. '60	RALEIGH, N. C., SEPT. '60	SAN BERNARDINO, CALIF., SEPT. '60	SCRANTON, PA., AUG. '60	SEATTLE, WASH., AUG. '60
MALE JOBS, EXCEPT WHERE OTHERWISE SHOWN									
MAINTENANCE AND POWERPLANT: Average straight-time hourly earnings									
Carpenters, maintenance	$ 2.89	——	$2.00	$ 2.10	——	——	$ 2.83	$2.25	$ 2.77
Electricians, maintenance	3.05	$ 2.48	2.18	1.96	$ 2.55	$ 2.53*	3.10	2.55	——
Engineers, stationary	3.15	2.61*	1.95	——	2.13*	——	3.04*	——	2.86
Firemen, stationary boiler	2.62	2.14	——	1.51	——	1.31	2.58	1.64	2.48
Helpers, trades, maintenance	2.45	——	1.54	1.57	1.78	1.61*	2.43*	1.86	2.29
Machinists, maintenance	3.05	2.65	2.43	2.03	——	——	3.06	2.47	2.93
Mechanics, automotive, maintenance	2.88	2.52*	1.95	2.14*	2.24	2.28*	2.97	2.48*	2.73
Mechanics, maintenance	2.89	2.39	2.22	2.10	2.27	1.97	2.98	2.50	2.93
Millwrights	3.05	——	——	——	——	——	——	——	2.81
Oilers	2.55	2.28	——	1.33	——	——	2.42	1.83	2.37
Painters, maintenance	2.88	2.32	——	——	——	——	2.74	——	2.83
Pipefitters, maintenance	2.91	2.59	——	——	——	——	2.94	——	——
Sheet-metal workers, maintenance	3.00	——	——	——	——	——	——	——	2.97*
Tool and die makers	3.22	2.84	2.78*	——	——	——	3.15	2.83	3.12
CUSTODIAL AND MATERIAL MOVEMENT: Average straight-time hourly earnings									
Guards	2.44	——	——	——	1.61*	——	2.44	1.70	2.37
Janitors, porters, and cleaners	2.14	1.94	1.35	1.30	1.42	1.25	2.05	1.55	2.08
Janitors, porters, and cleaners (women)	1.91	1.66	1.15	——	1.14*	1.04*	——	1.35	1.80*
Laborers, material handling	2.35	2.02	1.37	1.40	1.75	1.26	2.12	1.63	2.26
Order fillers	2.37	1.98	1.47	1.40	1.67	1.55*	1.80*	——	2.51
Packers, shipping	2.36	2.13*	1.37	1.61	1.70*	1.37	2.31	1.57	2.19
Packers, shipping (women)	1.82	——	1.07*	1.37	——	——	——	——	2.12
Shipping clerks	2.36	——	1.59*	1.92	1.89*	——	——	1.79	2.45
Shipping and receiving clerks	2.46	——	1.68	1.68	1.90*	1.85*	2.48*	1.68	2.53
Truckdrivers, light (under 1½ tons)	2.64	——	1.50	——	1.37*	1.20*	1.93*	2.20*	2.44*
Truckdrivers, medium (1½ to and including 4 tons)	2.54	2.48*	1.30	1.96*	2.13*	1.57*	2.14	2.40*	2.73
Truckers, power (forklift)	2.45	2.13	1.50	1.81*	2.02	1.44	2.39	1.89	2.40
Truckers, power (other than forklift)	2.86	——	——	——	——	——	2.56*	——	2.38
Watchmen	2.04	1.81	1.23	1.28	1.28*	1.15*	——	1.43	2.08
FEMALE JOBS, EXCEPT WHERE OTHERWISE SHOWN									
OFFICE, PROFESSIONAL, AND TECHNICAL: Average straight-time weekly earnings									
Comptometer operators	79.00	——	60.00*	50.50*	65.00	54.00*	——	72.00*	84.00
Draftsmen, senior (men)	122.50	111.50	——	103.00*	102.50	117.00	136.00	94.00	109.00
Draftsmen, junior (men)	93.50	——	67.00*	——	79.50*	——	100.50*	78.00	86.50
Duplicating-machine operators	70.00	——	——	——	——	——	——	——	61.50*
Keypunch operators	80.00	56.50	53.00*	51.50*	62.00*	59.00*	82.50	61.00	79.00
Nurses, industrial (registered)	99.50	——	——	——	——	——	104.00	75.50	99.00
Office girls	63.00	——	——	——	43.00*	——	——	——	64.50
Payroll clerks	85.00	——	62.50	54.50	70.50*	64.00	73.50	53.50	85.00
Secretaries	101.00	82.50	68.50	68.00	88.50	75.00	94.00	74.50	97.50
Stenographers, general	82.50	68.00	60.00	——	70.00	60.50*	85.00	59.00	82.50
Typists, class A	82.00	——	59.50	——	62.50*	60.50*	78.50	——	79.50
Typists, class B	67.00	55.50	50.00	48.50	58.50	57.00	67.50	52.00	69.00

Get the most from indirect labor dollars

With indirect labor eating up a bigger and bigger share of your manufacturing dollar, you *must* optimize these costs. Make sure you aren't paying for more than you're getting, and that you're not getting more (or less) than you need.

To help in analyzing costs, here are exclusive figures supplied by the U.S. Department of Labor's Bureau of Labor Statistics. They are the first of FACTORY's 1961 surveys of indirect labor wages around the country. To compare them with last year's figures, see the April issue, page 110; June, page 100; July, page 93; and November, page 87.

GRASS-ROOTS TRAINING FOR YOUR PLANT ELECTRICIANS

New package course for your electrical staff brings big-city training to your home-town plant.

Is your electrical maintenance crew short on training, morale, or competence? Is your plant engineering staff weak on electrical know-how? Have you gnawing doubts about your own understanding of modern electrical equipment or system design?

If so, you can stop worrying. Help is on the way.

At least it's on the way for those of you who are served by the many utilities belonging to the Industrial Electrification Council (750 Third Ave., New York 17). The Council has a brand-new packaged training program aimed at home-town training of industrial plant electrical personnel.

Up to now electrical training for plant men has generally been on a hit-or-miss basis. Schools and colleges have helped most, according to FACTORY's 1958 Electrical Survey (August issue, page 52) followed by equipment manufacturers, utilities, and the American Institute of Electrical Engineers or local electrical leagues.

The Council's new course is aimed at a non-engineer audience, with somewhat less mathematics than the "Red Book" electrical training courses sponsored by active AIEE branches in recent years.

Here's how it will work: Any utility, electrical league, or other group can purchase at cost this well-planned course complete with leader guides, 137 slides, special busway slide kit, magnetic circuit display board, student texts, and diplomas. Leaders' guidebooks are thorough, give minute-by-minute timing on demonstrations, suggestions for student orientation, a list of all props, reference books, etc.

In addition, four equipment manufacturers have agreed to loan equipment demonstration kits: Bussmann Manufacturing Company, St. Louis (fuses); Westinghouse Electric Corporation, Pittsburgh (capacitors); Bulldog Electric Division, Detroit (trolley ducts); I-T-E Circuit Breaker Company, Philadelphia (interlocks). Also, Aluminum Company of America, I-T-E, Westinghouse, and G-E will loan additional films adapted for the course.

The course is designed for ten 2½-hour demonstration-type lectures (plus a 10-minute break). The first six nights cover low-voltage distribution (600 volts and below), the last four cover high-voltage systems and planning. Here are some of the subjects treated: one-line diagrams, conductors, protective devices, system planning, voltage selection, preventive maintenance, motor control, cost estimating, grounding, substations, power factor.

There'll be homework to do and instructors are expected to encourage plant men to sit around after the sessions to discuss their own plant problems. Tuition charges will be modest.

Council headquarters expects most utilities will offer the course. Many will decide on the basis of demand from industrial customers. And those plants that want the training badly enough (but can't persuade their utility to sponsor it) can buy their own—at $440—from Council headquarters.

HIDDEN WASTE IN AIR TOOLS AND SYSTEMS

By RICHARD ALLCHIN, President
Rotor Tool Company, Cleveland

In over a hundred tests recently run in a variety of metalworking plants, the average power output of all portable air tools tested at the actual point of use was only 60% of the original power at full air pressure. In the case of assembly tools, torque was frequently found to be below that specified by the plant's own quality control standards.

These studies spotlight a problem of hidden waste and inferior tool performance of which plant managers—and even some people in the compressed air industry—are just becoming aware. Although they're no panacea, the guidelines that follow will allow you to come up with plenty of down-to-earth solutions that will pay off in terms of your actual operating conditions.

The first thing to attack is pressure loss at the tool itself. Customarily, a maintenance man checks the pressure with a hypodermic-needle air-gauge. He pushes the needle into the hose, runs the tool under full load, and reads the gauge.

The idea that this gauge reading is accurate is one of the biggest fallacies in air-system maintenance, since it overlooks the critical pressure drop in the last fitting of the hose. This fitting normally drops pressure another 4 to 6 pounds. With a quick-disconnect type that's too small, there is often a further drop of 10 to 15 pounds.

HOW TO TEST

There's only one sure way of determining tool pressure accurately—that's to measure it right at the tool inlet. A maintenance man can do this simply and effectively by using an air-line test kit (commercially available, or you can assemble your own) consisting of a pipe tee, an air gauge, and appropriate adapter nipples and bushings. The maintenance man has only to insert the appropriate adapters, connect one end of the tee to the hose, the other end to the tool, and the air gauge to the tee's side tap. With the tool under full load he then registers actual pressure delivered to the tool.

Although air tools need 90 psi. for normal operating efficiency, you may find to your surprise that pressure at the tool is frequently 70 or 60 psi., and in too many cases only 50 psi.

If pressure is too low, it may be due to one of three reasons:

First one is final quick-disconnect fittings. If this is the culprit, as little as $5 spent for the right final fitting (or $25 for an adequate hose and fitting) can restore the tool to peak operation. Payoff time for such an investment may be only a few weeks.

Second thing to look for is leaks. We've seen cases where 30% of the air is lost by leaks. To remedy this, regular checks should be made of the hose, valves, down pipes, and branch lines. Check leakage and compressor running time over the weekend. (Editor's note: See "Compressed Air Systems," FACTORY, October 1960, page 93.)

Third reason: Your compressor may be too small to do the job. If so (assuming your air distribution system piping isn't undersize), compressor capacity to be added can be computed this way:

$$\frac{\text{psi. air pressure desired}}{\text{psi. average actual air pressure}} - 1.0 \times 100 = \%\text{ more air capacity needed}$$

Does pressure boost really mean more production? Generally speaking, the answer is yes. However, as any experienced production man knows, increasing horsepower does not always result in a corresponding increase in production. With new tools, pressure from 70 to 90 psi. will raise horsepower 90-70 ÷ 70 or 28%. But actual tests on metal removal show less than a 20% increase in production.

The reason? New tools may have more power than strictly necessary for the job.

On the other hand, the same tests show that when tools are old and not in repair, any pressure below 90 psi. will seriously affect performance. Here a boost from 70 to 90 psi. will net a production gain greater than the increase in horsepower.

In air-system improvement studies, remember that grinding tools are in a special class. Their performance is more dependent on speed than other tools are. New grinders are usually equipped with some spare capacity, but when the tool wears or supply pressure drops, metal

MEASURING AIR PRESSURE at tool inlet is sure and effective with this air-line test kit. Pipe tee is connected between air hose and tool; air gauge is connected to tee's side-tap. Unlike the customary hypodermic-needle air-gauge test, this does not overlook serious pressure drop in final fitting.

How to determine if additional compressor will pay off

TOOL ANALYSIS

A. Actual tool payroll affected per week (no. of operators × rate per hours × average factor of use)	=	$ 1,428.00
No. of operators	=	40
Rate per hour (Fringe benefits and all overhead included)	=	$ $2.55
Average factor of use (by time study)	=	35%
B. Increased production from better air pressure Tool pressure 60 to 90 psi. (by plant tests)	=	40%
C. Increased value of production (A × B)	=	$ 571.20
D. Less extra power cost (1¢ per kwhr.)	=	$ 36.98
E. Net increased value of production (C — D)	=	$ 534.22

COMPRESSOR ANALYSIS

F. Extra air needed to bring pressure to 90 lb.	=	425 cu. ft.
G. Cost of compressor, including standard equipment, installation, and average piping		$22,689.00

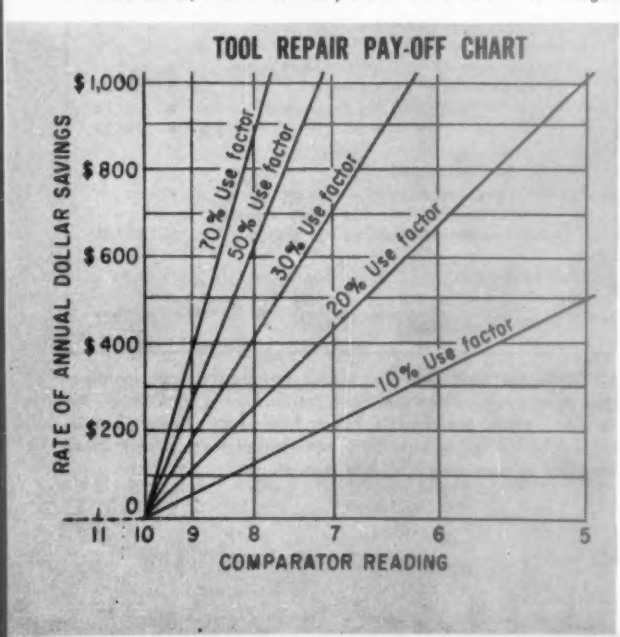
TIME TO REPAY

$$\frac{\text{Cost of compressor (G)}}{\text{Increased production (E)}} = \frac{\$22{,}689}{\$534.22} = 43 \text{ weeks to repay}$$

FINDING PAYOFF TIME for added compressor capacity takes only a few calculations like those on the above work sheet. Be sure to include overhead in hourly labor cost. Don't guess at the values for use factors. Take time to get them through work sampling or time studies in your own plant.

TOOL PERFORMANCE COMPARATOR above eliminates extra man, calculations, and elaborate layout needed with prony brake. Pressure on pedal increases load by putting more pressure on flexible brake band around pulley. Tool output is measured on post-mounted spring scale in arbitrary units (0 to 10).

TOOL REPAIR PAYOFF CHART like the one below (based on $5000 annual per operator labor cost) can be constructed to simplify tool repair decisions. To find initial annual savings, draw line vertically from comparator reading to intersection with use factor, then horizontally from intersection to left margin.



removal rate drops drastically. If you check metal removal rates in the shop, you'll find that at 60 psi. a typical grinder is hardly cutting (especially if it's worn), so increasing supply pressure from 60 to 90 psi. will increase output far more than the 50% that was shown by calculations.

To find out if it will pay to provide more air, you have to start with added compressor payoff calculations like those at the bottom of the preceding page.

WHEN TO REPAIR

Portable tools come into the maintenance shop for a multitude of reasons. By far the largest number are for minor repairs. Here, there is no question of not doing the repair since it costs little. Others come in for reasons that are obvious: broken handles, stripped spindle threads, and the like.

The big questions of repair, however, involve tools that are operative, but unable to do the job efficiently. Often these tools may not even be turned in for repair unless performance is so bad the operator or his supervisor can no longer ignore it.

Until recently, performance tests required bulky, expensive, complicated equipment. As a result, they weren't made. This meant there was no way to tell if repairs would pay or not, or if repaired equipment was up to par. Usually, the maintenance staff depended on experience or guesswork.

Now, this has all changed with the development of test devices that are well within the means of most plants. One of these is the new portable-tool comparator (at left), which is used to test rotating grinding or drilling tools. A modified prony brake, it is inexpensive and simple to operate and can be built in the maintenance shop from available blueprints or purchased from the manufacturer (Rotor Tool Company).

The device works on a comparative rather than a theoretical basis. You begin with a tool known to be adequate under on-the-job tests. The output of this tool is arbitrarily marked as "10" on the comparator. (A new tool with excess capacity may be "11" or "12" on the scale.) A production tool that tested "9" (i.e., having only 90% of needed output) would not be adequate, and should be repaired. The goal here is to simplify decision-making on repair.

You can further simplify decision-making by using a tool repair payoff chart like the one at left. It assumes a $5000 annual labor cost, so lay out your vertical scale accordingly. The horizontal scale is set up so that a comparator reading of "8" means the tool has 80% productivity. Repairing to "10" would be a 25% improvement. Location of "8" is 25 units from origin; "7" is 43 units away, and so on. Savings shown are those at the beginning of the repair period, *so average savings would be one-half these values.*

An important advantage of the chart is that it makes payoff estimates available *before* a tool is repaired. Using actual plant use factor for the tool involved, the maintenance staff can quickly check initial annual savings that will be yielded.

can be combated with the program outlined below

In the case of impact wrenches, decisions on performance are simpler. If torque is inadequate (or too inaccurate) to meet quality control standards, the tool must either be repaired or replaced. The question is whether the tool warrants repair. Torque readings can be readily taken with instruments like the Skidmore-Wilhelm tester. For screwdrivers and nut-setters, the Livermont analyzer will do the job. Where economy is all-important, these tests can be simulated by taking a series of bolts, nuts, or screws that the tool is used on and measuring tension or torque produced with a standard hand torque-wrench.

Repairs are made on tools for the purpose of increasing productive efficiency. *Unless savings are greater than the repair cost, they are not justified.*

To figure the cost of repair, the maintenance man should take the tool apart and, with the help of the supervisor or purchasing department data, calculate the total cost of repair parts and labor.

Remember that payoff charts or calculations have to be used with good judgment. Even though the correlation between power increase and production increase is close in the case of tools badly in need of repair, it isn't necessarily true for all tools, especially if air pressure is inadequate.

HOW TO REPLACE

Paradoxically, many plants devote a great deal of time and attention to studying the economics of replacing heavy machine tools, but little time to portable tools—perhaps because the investment per tool seems so small. Yet efficiency loss in portable tools is far more rapid. On the average, operator labor cost for a portable tool is only a little less than that for a machine tool. Furthermore, the total labor bill affected by a drop-off in portable tool efficiency is frequently far greater than an equivalent deterioration in machine tool productivity.

It makes sense, then, to scrutinize portable tool performance just as thoroughly and even more frequently than that of big tools. A plant that has the right test set-up can schedule testing of production tools on a routine basis, and catch underpowered tools before they cause production losses.

Regardless of the payoff shown by the chart, however, repairs may be poor economy if existing tools are made obsolete by improvements in new tools. So plant personnel guided by the chart (or other methods) need to be kept informed of developments in new tools as fast as they occur. When considering a new tool that has greater power than the old one, check to see if this additional power will really increase production above that of a repaired tool.

Actually, improvements in new tools have been so substantial that many plants have found a planned replacement program is the only satisfactory way of avoiding the high cost of using obsolescent equipment.

Such a program should be set up after the initial check-up, which will probably reveal a substantial number of tools that should be replaced. In carrying it out, you should find the poorest tools and replace them first. Simply going after the oldest tools is not very effective because serial numbers are often lost and some tools may have spent their useful lives in heavy-duty work while others were used on light work.

How to determine if new tools will pay off

Time per operation with present tool	=	20 minutes
Time per operation with new tool	=	7 minutes
Savings	=	13 minutes
Divide savings by present time	=	65% saving
Amount of time tool is used	=	25%
New tool payoff time		
Hourly rate (total)	=	$ 2.50
Price of new tool	=	$220.00
Savings per week	=	$ 16.00

(65% saving × 25% use × $2.50 rate × 40 hrs. per week)

Time needed to pay for new tool = $\frac{\$220}{\$16}$ = 13¾ weeks

PAYOFF TIME for new tools can be found with a simple work sheet like this. Fast payoff for some tools may surprise you.

Individual plants should set up their own schedules, but the following table will give you some idea of typical annual replacement rates:

Screwdrivers and nutsetters	**15%**
Heavy-duty grinders	**25%**
Light-duty grinders	**10 to 15%**
Impact wrenches	**33%**
Scalers	**25%**
Chipping hammers	**20 to 30% (occasionally 40%)**

The payoff time for these tools can be found by using a work sheet like the one above.

Two cautions are in order. Replacement schedules should not preclude or stop the purchase of new tools that are better than existing tools and will rapidly pay for themselves. And the replacement schedule should be adjusted from time to time.

Plants that want air tools to operate at top efficiency have found it pays to have one man (or a small, well-integrated team) responsible for all three programs—keeping air pressure up, repairing, and replacement. Just as portable tools run down in power as they are used, so air-system improvement programs lose effectiveness unless they're pushed by plant men with authority and determination.

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MAINTENANCE OPINION SURVEY

Nobody knows better what to do about improving maintenance costs and service than the men who maintain and the men who operate the facilities. So Lukens Steel asked both groups for their ideas, in a carefully planned survey. It got lots of good answers fast, and put them to work pronto.

Want to improve the organization and operation of your maintenance set-up? Then ask the people who are arm-deep in the work for ideas. But don't stop there. Go a step further and get the thoughts of your production supervisors, too. This group may have some good ideas on just how your maintenance service can be strengthened.

These were the reasons underlying a recent maintenance improvement survey at Lukens Steel Company, Coatesville, Pa. It was made with the help and guidance of Albert Ramond and Associates, management consultants. The well-planned survey covered 58 maintenance general foremen and superintendents, as well as 16 production superintendents and managers.

But did Lukens really need a maintenance improvement survey? As to over-all operations, it didn't. Over the years the company had already done a top-notch job in this area. But higher management, as well as maintenance and production people, felt there was still room for more savings and better service. Also, Lukens realized that improvement is a continuing task. Yesterday's improved method can be tomorrow's obsolete one. A survey like this would help uncover and update outworn methods. It would also squelch the possibility of any rumblings about maintenance operations falling behind the times.

The survey covered all major areas of operation of the 1350-man maintenance organization. In less than three months, Lukens completed it and correlated the results. The promptness in publishing the results added to the impact of the project. And it convinced all concerned that Lukens attached much importance both to the survey and the expected results.

The survey took a triple-questionnaire approach. First, all participants filled out one of two lengthy questionnaires containing many searching questions. One questionnaire was specially prepared for the 58 maintenance supervisors (all above level of shift foremen), another for the 16 key production executives. All respondents enlarged on their views in subsequent personal interviews. During these person-to-person talks, the interviewer filled in a third questionnaire specially devised for his guidance.

Was the survey worthwhile? Lukens thinks so. It disclosed some specific areas for real improvement, as we shall see. It also led to these benefits:

- Made everyone freshly conscious that maintenance is an operating problem.
- Made everyone think more about ways to cut maintenance costs and improve maintenance service.
- Documented these thoughts, thus getting a better view of maintenance problems and their solutions.
- Encouraged better rapport and communications among all supervisory people.
- Helped build a good climate for acceptance of ideas for maintenance improvements because these ideas originated with the "customer."

The survey *was not* a simple opinion survey like "What's good or bad about our maintenance set-up, and how would you improve it?" It *was* carefully planned from start to finish with regard to respondents, timetables, types of questions, summarization of opinions, and validation of opinions. Here are the key moves that insured its success:

Ample publicity. Lukens made a special effort to inform everyone involved of just what was going to happen. It told them the purpose of the survey and what the company hoped to accomplish. Periodic progress reports followed until a fact-finding report made the final results known. Much of this information was passed to those involved, in special meetings as well as by word of mouth through established channels. Top management was briefed in the same manner.

As a result of this excellent indoctrination and follow-up, all those who received the survey questionnaire (and were later interviewed) were enthusiastic and cooperative. This acceptance did much to speed completion of the project and insure its success. Naturally, once the survey was started everyone was anxious to see what suggestions would result and what would be done about them.

DIGS FOR IDEAS

Of the 74 respondents, 16 were key production men, such as this superintendent of the melting department.

Here, too, Lukens concentrated on good communications. It made sure a copy of the final report on the project was made available to all associated with the survey as well as to top management.

Special questionnaires. Each questionnaire had to be tailored to give the kind of information wanted. Unlike most questionnaires for employee use, those used in the Lukens survey were not limited to "yes" and "no" answers. The company wanted meaningful answers on which to base future improvements. Answers in generalities wouldn't do. So in the design of each questionnaire adequate space was provided under each question for a one-paragraph answer.

Nor were the questionnaires limited to one or two pages in length. Here again, Lukens wanted the full story, in depth. It invited reactions from maintenance people as to the adequacy and effectiveness of the maintenance organization, planning, scheduling, preventive maintenance, procedures, materials, equipment and facility control, cost control, work measurement, labor utilization and training. It asked production people what they thought of maintenance in their areas and exactly how they felt it could be improved. And it made plain it wanted constructive comments rather than pure criticism.

No attempt was made to maintain secrecy about "who said what." But identities were dropped in the summarization of suggestions leading to conclusions and final report. This treatment added to the survey's effectiveness. If participants had hesitated to "go out on a limb" in some cases, the company would not have received the information it desired.

The questionnaire to maintenance men contained 48 pinpointed questions. It probed for both facts and opinions. Some typically challenging questions:

- What percentage of the total man-hours are used for inspection of facilities?
- Would a more extensive preventive maintenance program shorten delays in operating equipment?
- Are tools and equipment adequate to do the job?
- Is the spare parts inventory adequate?
- How much of your time is spent on paperwork, meetings, and clerical-type jobs?
- Are you satisfied with the condition of the major portion of operating equipment in your area?
- Do you have an adequate work force to handle the current maintenance workload?

The questionnaire to production men had only 21 queries. But these were equally penetrating:

- Are the facilities in your department in a good state of repair? If not, specify where and why not.
- Can delays on your facilities caused by maintenance services be reduced? How? By what per cent?
- Have you issued any maintenance work orders that are not completed or in active progress? If so, how many, and what percentage of total issued?
- What would you recommend to improve the preventive maintenance program?

Fast replies. Questionnaires were distributed simultaneously to the designated maintenance and production people. They were asked to return completed forms within one calendar week. This gave enough time to think over the answers. Yet the interval was short enough to keep interest at a high level. As soon as each questionnaire was returned, the information was reviewed by the participant's immediate superintendent and the staff consultant. It then formed the basis for a personal interview to follow promptly.

Interview checklists. Three staff members of the Lukens management group and a staff consultant conducted the final interviews. Remarks made during the interviews were considered confidential. First, each participant was asked to give more details on the answers submitted in the written questionnaire. He was also asked to back up conclusions with facts and figures. Or, if he could, to cite actual examples that would pinpoint areas for improvement. During the interview the original questionnaire served as a primary basis for the interviewer's questions, and for recording some of the supplementary data.

But the personal interview went further. Lukens

Personal interviews supplemented information from questionnaires. The 74 sessions took between one and two hours each.

. . . OPINION SURVEY

provided the interviewers with a checklist for their guidance in probing for unrecognized critical areas. This checklist covered all the elements of a good maintenance program. It contained some 100 check points for evaluation of mechanics, foremen, staff, work-order procedures, time and material controls, planning, scheduling, worker productivity, preventive maintenance, equipment records, and cost controls.

Use of the checklist standardized the pattern of interviewing. Interviewers were sure to cover specific critical areas pertinent to the organization and operation of the maintenance function. Thus no facet of maintenance was overlooked. The interviewer inserted answers directly on the checklist.

One final page of the interview checklist required the interviewer himself to answer eight specific questions about the interviewee. These pertained to his impression of the material presented by the participant. It helped the interviewer rate each participant on his skill and knowledge as a manager. It also disclosed areas where additional management training might be advantageous.

Interviews took from one to two hours to complete. This may seem time-consuming, but Lukens felt it was a small price to pay for ideas for future improvements in maintenance methods.

Validation technique. Additional facts and figures are always needed to substantiate and implement results of any survey. Realizing this, Lukens analyzed maintenance operating costs and maintenance labor utilization data for two comparable periods in 1959 and 1960. This helped to check the dollars-and-cents feasibility of certain suggested improvements at two operating levels. (Figures for the 1959 period varied from those in 1960 because of the difference in mill operating levels.) Moreover, these figures furnished Lukens with benchmark information for measuring final results of the program.

In the maintenance cost area, Lukens made a special cost breakdown by division, subdivision, and department on the basis of labor, fringe benefits, materials, and overhead. Labor utilization data covered manning, performance percentages, goal attainment percentages, and coverage percentages. Such breakdowns helped point out areas where improvement could yield the best return.

Final step was the correlation of results of all questionnaires to arrive at reliable conclusions. This was handled two ways. First, questionnaire and interview results were tabulated in a functional pattern (by type of maintenance, by craft or equipment.) This meant listing each question, then placing the answer under appropriate subdivisions describing the craft involved, such as electrical, mechanical, and the like. Second, improvement suggestions were recorded on an over-all basis (anonymously in order of mention, on an accumulative list). Large sheets of paper were used to record the initial tabulations, which were analyzed and digested. At this point those that were individual gripes became obvious. However, if a suggestion or complaint came from several sources, it was obviously worth investigation.

On the basis of these two types of breakdown information, Lukens was able to spot prime improvement areas both in individual maintenance functions and in the over-all set-up. The functional breakdown pinpointed problem areas in craft groups. The over-all correlation highlighted areas where the entire maintenance function could be improved. The combination of these results then became the basis for management's investigations into improvement measures.

Major conclusions. Lukens' maintenance performance showed up well in most areas on an over-all basis. However, planning, shop scheduling, and preventive maintenance emerged as the areas where improvement could yield maximum benefits.

These three functions had previously been handled on a production area basis. The topmost disclosure of the survey was the need for a plant-wide, standardized approach to planning, scheduling, and preventive maintenance. Such a program is now being activated. By doing this Lukens hopes to get maintenance work done in a sequence that will minimize downtime and interference with production schedules. It will also achieve better utilization of manpower, improve determination of manpower and workload needs, and make estimates of completion dates more accurate.

By strengthening preventive maintenance, Lukens hopes to keep equipment in better operating condition regardless of the number of shifts it operates. This will reduce high-cost emergency breakdowns and production losses. In addition, the company wants to keep up-to-date records on the condition of every major piece of equipment. These data will help management forecast equipment life expectancy more accurately.

There's no doubt in the minds of Lukens management that these improvements in its maintenance organization will pay off. They represent the concensus of an opinion survey of all the men who are in the front lines and close to operating problems.

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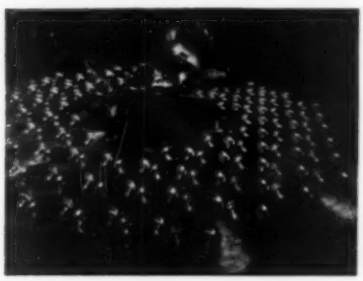
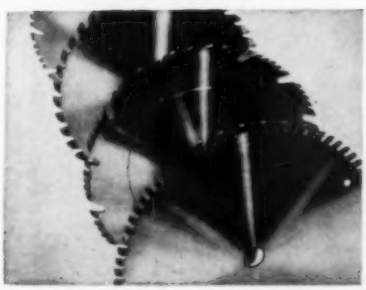
ARTIST AT WORK is an apt description for this welder. It also demonstrates that the skilled worker is far from obsolete. The work could be programed into a machine, but quality dictates human skill. . . . . **p. 176**



COMMAND DECISIONS are necessary when it's a question of building a new plant or expanding the old. But such decisions are tough to make. This list will help you avoid the pitfalls of a snap judgment. **p. 226**

MISSING LINKS like the Abominable Snow Man will probably never turn up. But one found in a different area is this electronic weight comparator. . . **p. 106**

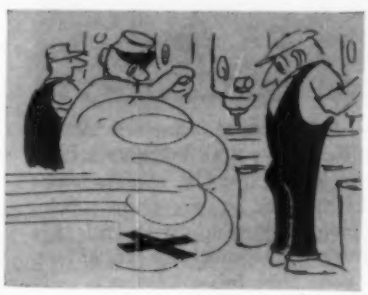


FLYING SAUCERS? Not by a long shot. They're saws described in this catalog-handbook. . . . . **p. 206**

FACES AND FORTUNES is a new film that explains how today, more than ever before, a company must control what the public thinks about it. . . . . **p. 264**

TOO MUCH TENSION is a hazard faced by all executives. Here's an idea for eliminating it. . . . . **p. 158**

EMPLOYEE-SNATCHERS at work in this county have caused an unusual situation to develop. . . . . **p. 186**



TIED DOWN to one machine layout? Fibrous glass pads eliminate fastening, allow new freedom. . . . **p. 248**

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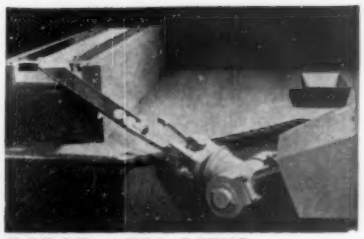

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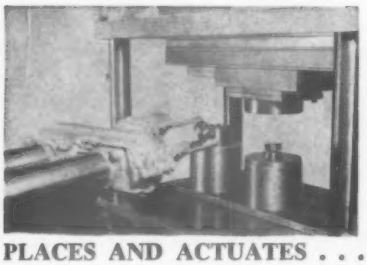


PLACES AND ACTUATES . . .

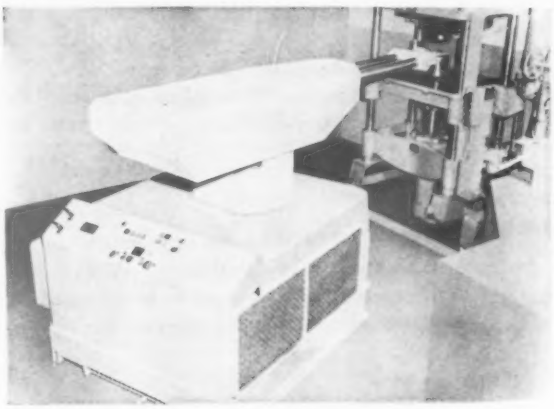
MOVES TO CONVEYOR . . .

Does 196 more tasks

A human arm and brain would bog down trying to follow 200 sequential commands, but not Unimate. This robot thinks for itself so well it learns to perform tasks by being led through the motions just once.

After running through entire cycle (to 200 operations) it starts all over again. But there's no built-in obsolescence. Once a job cycle is completed, robot can be re-taught another series of operations.

The hydraulically operated arm telescopes from 3 to 7 ft., sweeps over a 220-deg. arc, moves 60 deg. vertically. The "hand" attached to the rotating-and-bending "wrist" can be fitted with clamps, pneumatic wrenches, screwdrivers. *Consolidated Diesel Electric Corp.* (Circle 90)

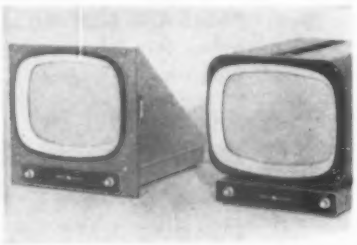


93—Safety ramp allows one man to transfer heavy floor machine up and down stairs quickly. Safety stops hold machine at any point. Telescoping sections adjust to 15 ft. It's lightweight; has anti-slip rubber feet. *Orchard Hill, Inc.*

91—Dictation system converts any plant PBX or PAX switchboard to central recording facility. By dialing pre-set numbers on dial phone, dictation is recorded remotely on reusable magnetic belts. Voice-actuated; uses phone company links. *International Business Machines Corp.*

94—Ball valve features improved sealing, compact one-piece forging, and built-in union ends. Easy to install, operate, service. Downstream line can be disconnected under pressure without adding extra parts. *Clayton Mark & Co.*

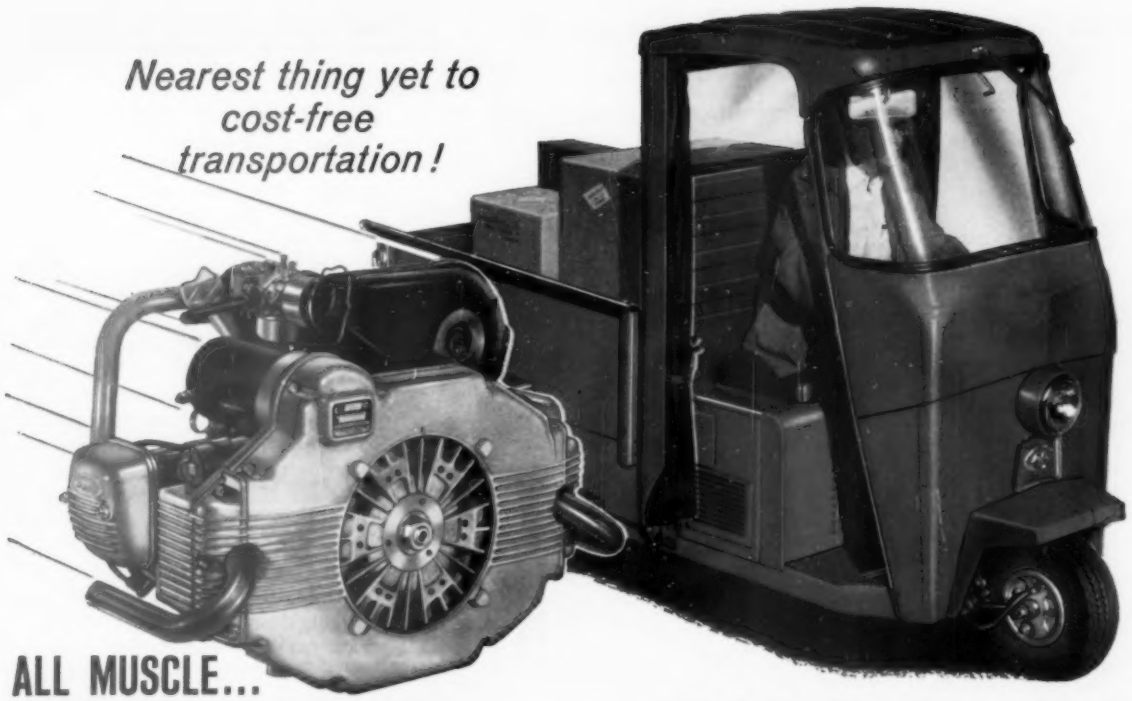
92—Heating container warms, cooks and dries process materials. Has steam or hot water flowing through embossed channels on underside. Eliminates jacketing, pipe, and tube coils. Sizes: 18x24x6 in. to 30x120x9 in. Installs on table or enclosed chamber. *Dean Products, Inc.*



95—TV monitor, for closed circuit system, produces 14- 17-, or 21-in. picture of exceptional detail—800-line minimum horizontal resolution. For use in high ambient light. Little affected by high-current wires. *General Electric Co.*

Turn the page

Nearest thing yet to cost-free transportation!



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A coast-to-coast survey of typical Truckster users not only proves greatest economy in every light hauling application, but reveals the wide range of uses to which the Truckster is being put. Survey results have been compiled in condensed form and are available upon request. Here are two examples:

ON-THE-STREET OPERATION

Blue print company in Texas, using Truckster for deliveries, reports operating cost of 0.93 cent per mile; maintenance cost of 0.73 cent per mile.

IN-PLANT OPERATION

Shipyard in Connecticut, using three Trucksters for movement of tools and equipment, reports 1.3 cents per mile operating cost; only routine maintenance.

Please send Cost Analysis Report and descriptive literature.

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Yes or no? Weight's the test

We've found another missing link for automated production lines. It's an electronic weight comparator that selects and screens parts and materials according to weight.

You can use it in continuously moving processing or production operations, or for any selective weighing task. Comparator weighs each item individually, automatically compares this weight to within plus or minus one gram of predetermined proper weight. Parts conforming to specifications are automatically passed on to next production step. As presently designed, the system handles items weighing up to 5 lb.

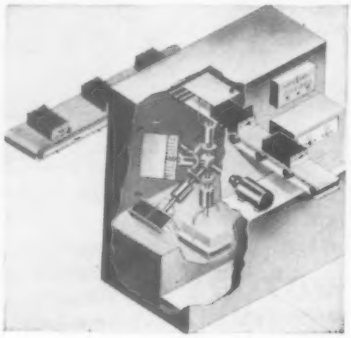
An example of its many applications is in extrusion operations. Here it handles and weighs metal billets and slugs to determine if volume of metal is within acceptable limits. Other possibilities: to identify different metals present in slugs of similar volumes; to inspect ball-bearing assemblies by weight; to grade (according to weight).

Built to function reliably through millions of sequences, it withstands rugged use under severe vibration and shock conditions. *Atronic Products, Inc.* (Circle 96)

Metal parts get velvet-glove cleaning

No Rube Goldberg contraption, this is an honest-to-goodness automatic ultrasonic cleaning system. It cleans, drains, dries, and unloads with planetary rotation and upending of tote boxes. Ideal for delicate metal assemblies and parts that won't tolerate friction or tumbling.

Conveyor-fed boxes move onto and lock on rotating platforms. Platforms mounted on paddle-wheel mechanism carry parts through process. *Autosonics, Inc.* (Circle 97)



98—Ultrasonic de-burring system uses powerful generator to remove microscopic burrs from parts. An example: It's a low cost way to de-burr, and polish stainless screws in 2 to 6 hr., depending on perfection needed. For precision tools, castings, etc. *Ultrasonic Systems, Inc.*

99—Removable-tire casters, in 3- to 10-in. wheel diameters, have tires that can be replaced easily by de-mounting separable cadmium-plated disks. Choice of wide range of caster series, wheel bearings, and either conductive or neoprene rubber tires. *Payson-Harris & Reed, Inc.*

100—Flexible duct cuff, of neoprene-coated cotton net, provides airtight, dust-tight connection when disconnecting duct from fitting. Stretchable cuff fits standard or oversized fittings; can be used with ducts from 2 to 8 in. ID. Comes attached to duct. *Wiremold Co*

101—Miniature pump is portable two-speed hydraulic unit developing up to 10,000 psi. at capacity of 4 cu. in. Good for high-pressure, low-volume power for knockout punch drivers, rams, jacks, pullers, etc. Has built-in, two-way control valve. *Greenlee Tool Co.*

102—Solid-state computer system greatly reduces costs by accepting common English instructions rather than machine language. Automatically schedules and keeps track of work load. Advises operator of mistakes. Solves two or more problems simultaneously. *Burroughs Corp.*

Turn the page

Solve Multi-Point Temperature Control Problems...

at ⅔ cost of competitive systems

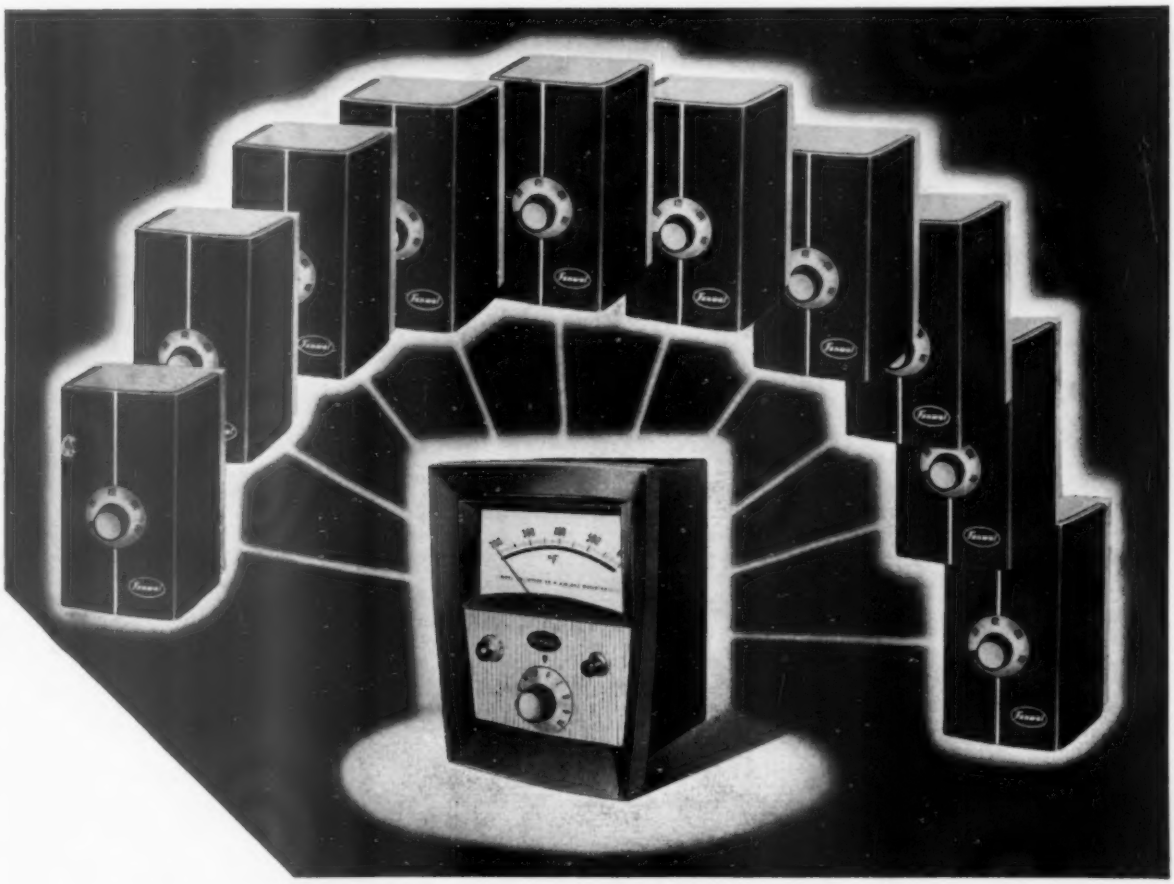
You get them all — wide ranging versatility . . . maximum sensitivity . . . easy installation and servicing! These features *combine* in a Fenwal 536-580 multi-point monitoring system to give you precise, transistorized temperature control and indication. And *you choose the features you need to suit your own requirements!*

Examine these cost saving advantages: Indication and control circuits are separate . . . the 536-580 system eliminates the need for separate indication and control at each point. You can build a control system concurrent with your needs — start with 2 points and build up to 10 points without paying a premium at the outset. The complete control system is built from *standard* catalog parts, thereby eliminating the need to buy costly "specials" for servicing at a later date.

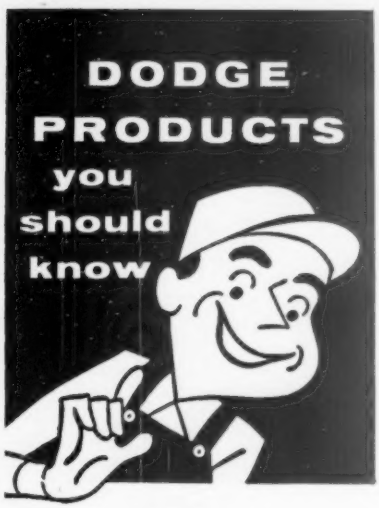
Individual points can have either proportioning or ON/OFF control modes. The system permits "flick of switch" indication of from 2 to 10 temperatures. Individual set points can be adjusted from a central control panel or through a separate potentiometer remotely located. You select your own number of points and you *pay only for the options you use.*

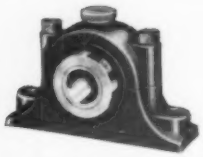
Choose from five standard temperature ranges — from −50 to 600°F . . . expanded scales permit fine temperature adjustments and improved readability, and *the entire system gives you sensitivity to within 0.1°F.*

Both instruments are smartly styled to perfectly complement modern industrial machines and interiors. A Fenwal engineer will be glad to supply information on this system, or any other temperature control in Fenwal's broad line. Write Fenwal Incorporated, 254 Pleasant Street, Ashland, Mass.



Another example of how **Fenwal** CONTROLS TEMPERATURE . . . PRECISELY



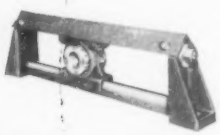


DODGE PILLOW BLOCKS with TIMKEN BEARINGS

America's Quality Pillow Blocks!

TAPER-LOCK STEEL CONVEYOR PULLEYS

Maximum strength with minimum weight!



DODGE TAKE-UPS

Complete range of stock models, sizes.

●

Write for Bulletins!

- ✓ Rolling Bearings — ratings, data.
- ✓ Conveyor Pulleys — technical data.
- ✓ Take-Ups — Roller, Ball, Babbitted.

DODGE MANUFACTURING CORPORATION
400 Union Street • Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

For more about these items, circle numbers on Reader Service Card next to back cover.

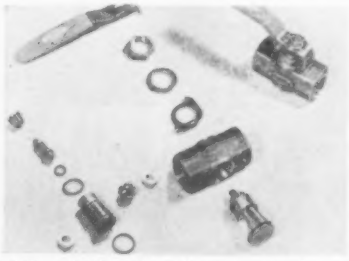
103—Hammer drive tool sets studs in concrete, mason blocks, or light-gauge steel without filling, drilling, or plugging. Reversible chuck—with short end, sets pins or studs, or installs wire loops; long end drives drill anchors. Rubber grip. *Gregory Industries, Inc.*

104—Ultra-violet paper converts Thermofax, Ozalid, Bruning, or Pease copying machines into multi-purpose copiers. Duplicates blueprints, drawings, printed or typed matter. Permanent black-on-white copies won't fade, smear, curl or stick together. *Transcopy, Inc.*

105 — Thermoelectric generators, packaged, are static and ideal for remote locations. Available in 5-, 10-, 50-, and 100-watt models. Use any type gas fuel. Low-voltage, high-current d-c output convertible to a-c with static adapter. *Westinghouse Electric Corp.*

106—Smoker's dunking station, permanently mounted type, has glass-fiber inner liner and steel sign with black lettering on white background. Polished or grey wrinkle finishes. Model 4J-R has six choices of wording for sign. *Standard Industrial Products Co.*

107—Motor control center has mechanical plus electrical interlock (micro-switch). Contactor must be open before units can be withdrawn. Accommodates non-reversing starters to size 4, circuit breakers to 225 amp. Modules for quick servicing. *Nelson Electric Mfg. Co.*



108—Ball valve has tapered cartridge containing seating assembly which is easily removed while body remains in line. Maintenance simplified with interchanging parts. In ¼- to 2-in. sizes, pressures to 800 psi., for temperatures from −40 to +400 F. *Crane Co.*

Turn the page

TERRIFIC!

— and how long will the flexing member last?

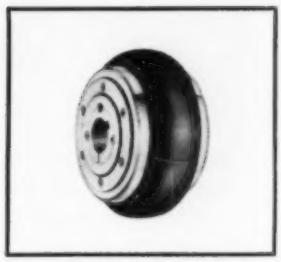
Good question. The heart of Para-flex is a tire with synthetic tension members bonded together in rubber — which provides a flexing body that automatically compensates for *all combinations* of misalignment and end float, and absorbs vibration as well!

This amazing coupling has now been used in American industry 4 years. Thousands are in operation — in steel mills, paper mills, oil fields, mines, quarries, chemical plants, everywhere — and in these 4 years, replacements of elements have been negligible.

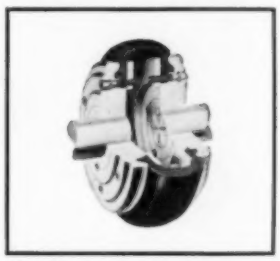
Dodge Standard Para-flex takes angular misalignment up to 4°, parallel misalignment up to ⅛" and end float up to 5/16" depending upon the size of the coupling and the duration of shaft displacement.

Dodge Para-flex is available in 3 types — Standard, Flywheel and High Speed (shown at right). The Standard type is stocked in capacities up to 3640 hp at 910 rpm. Ask your Dodge Distributor, or write us for complete technical bulletin.

Dodge Manufacturing Corporation, 400 Union Street, Mishawaka, Indiana



The new idea in flexible cushion couplings, with a flexing member that "swallows up" misalignment.



No lubrication, no maintenance. Replace flexing element without moving driver or driven machine.

Flywheel and High Speed Types. For use with motors and internal combustion engines turning up to 5230 rpm.

The Products with the Pluses . . .

DODGE

of Mishawaka, Ind.

DODGE
Para-flex
CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge he can give you valuable assistance on new cost-saving methods.

Facts of Light!

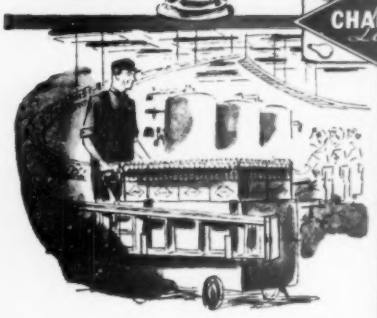
YOU CAN'T GET BOTH HIGH EFFICIENCY AND LONG LIFE IN INCANDESCENT LAMPS

General service incandescent lamps are designed so that the ratio between life and efficiency (light output) results in lowest overall lighting cost for the average installation. When efficiency is increased, lamp life is shortened. When lamp life is extended, efficiency goes down

SOME PLANT AREAS "STEAL" LIGHT

Poor reflective surfaces drastically reduce the useful light you get from a lighting system. For instance, brick walls reflect only about 13% light. Smooth walls painted white, on the other hand, reflect 80-85% light.

CHAMPION Lamps



GROUP RELAMPING SAVES 17 MINUTES PER LAMP IN MAINTENANCE TIME

Maintenance studies show that it takes an average of 20 minutes to replace a single burned out lamp as against 3 minutes when lamps are group replaced.

SIXTY YEARS' EXPERIENCE GOES INTO CHAMPION LAMPS

Champion has been manufacturing incandescent lamps since 1900 and fluorescent lamps since their advent in 1938. Over 3,000 types and sizes are available.

Your Best Buy in Lamps

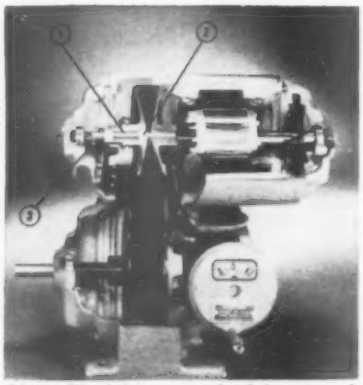
CHAMPION LAMP WORKS, Lynn, Massachusetts

CHAMPION INCANDESCENT-FLUORESCENT

FACTORY / EQUIPMENT NEWS

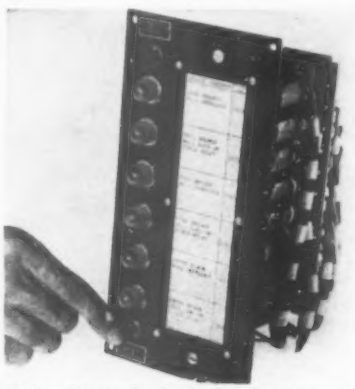
Begins on page 104

For more about these items, circle item numbers on Reader Service Card next to back cover.



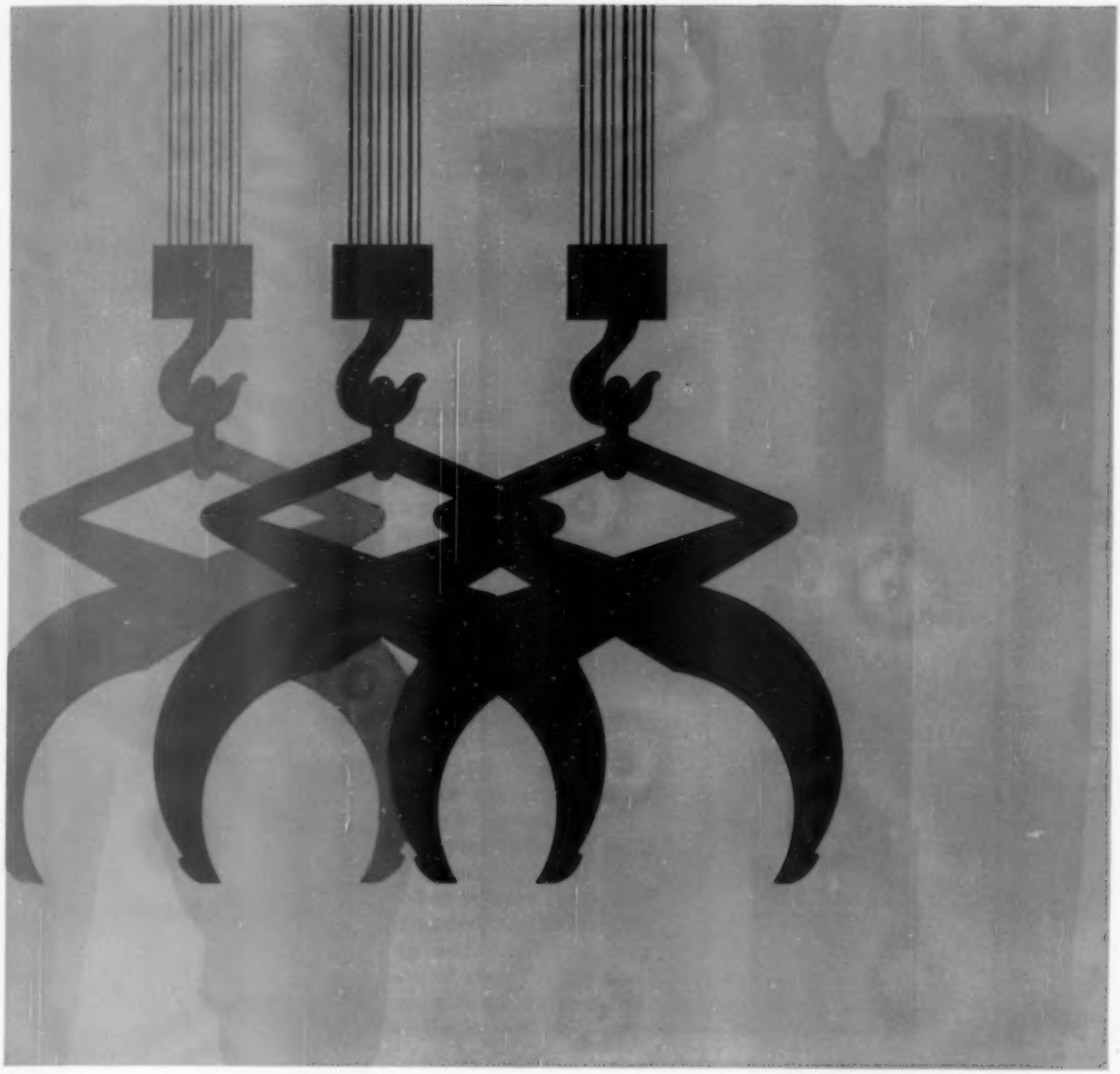
109—Variable speed drive needs no lubrication during lifetime. Nonmetallic load-bearing surfaces eliminate fret corrosion. No sticky or worn pulleys mean long bearing and belt life. In ¼ to 25 hp.; 0.4- to 4660-rpm. in 10:1 ratio. *Sterling Electric Motors, Inc.*

110—Tote Strap, of 2-in. web belting, adapts to many uses including handling of large refuse containers. Adjustable to 41½ in., these Strongboys have heavy-duty steel hardware, cadmium-plated against rust. No rivets to pull out under strain. *Voss Belting & Specialty Co.*



111—Static fault finder locates and remembers malfunctions in electrical controls. Lamp lights to show fault. Manual reset extinguishes lights when fault is corrected. If fault remains, light persists. Operates on 115 to 300 v. d-c, or 120 v. a-c. *Clark Controller Co.*

Turn to page 114



Manual and Motorized Sheet Lifters

Manual Low Headroom Coil Tongs

Scissor-type Tongs

Safely • quickly • efficiently Heppenstall can handle it

You'd go a long way to find a lifting or moving operation that hasn't been handled—and handled efficiently—by Heppenstall tongs. You name the load specifications—heavy, light, awkward, massive—and Heppenstall can match it with the right tong. Clearance and headroom a problem? Heppenstall can help with tongs that lift, stack in the tight squeezes and rotate 360°.

Let us know *your* specifications. Write or call direct.

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Plants: Pittsburgh & New Brighton, Pa. • Bridgeport, Conn.

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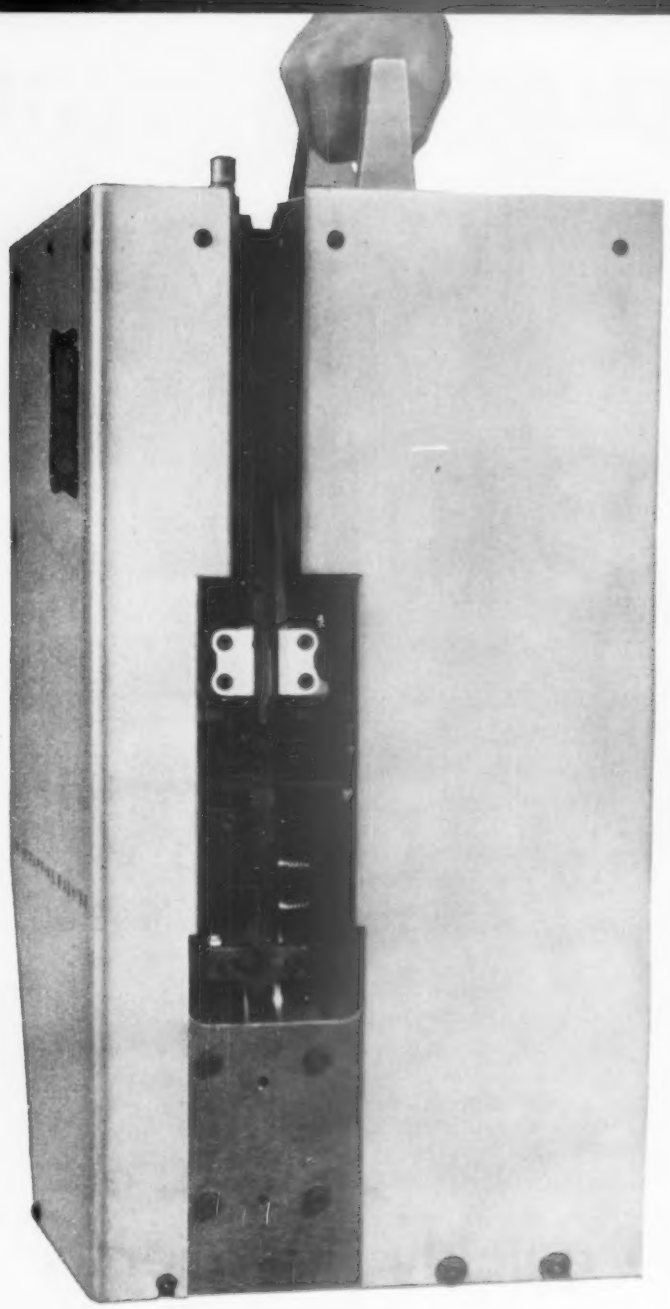
For more facts Circle 450 on Reader Service Card



Now, Acme Steel brings you *(literally!)*
the world's first strapping machine with

FULL-SIZE PERFORMANCE...

PINT-SIZE PRICE

THE REVOLUTIONARY **F7**

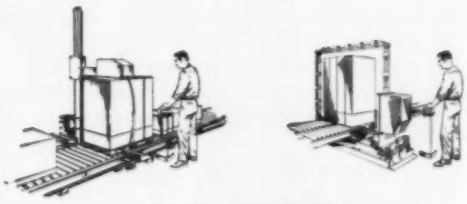
. . . so *compact*, we can carry it right into your plant . . . so *complete*, it does everything you want a powered strapping machine for: fast feeding, tensioning, sealing and cutting. And so *conservative in cost!*

The new F7 is not a stripped down facsimile of a larger machine. Its surprisingly low initial cost and operating economy are engineered into the strapping mechanism—a 75 pound, self-contained unit that doesn't rely on complex (and costly to service) electronic circuits. You can adapt it for any regular duty strapping job, equip it for the exact degree of automation you desire (at right are a half dozen actual applications).

Now, even modest volume operations can discard outmoded methods. Big users can set up additional strapping lines at a fraction of their former cost. And everyone can give production bottlenecks the slip—the low-cost F7 strapping mechanism can be replaced with a standby in a few minutes!

Call your Acme Idea Man for a quick *carry-in* demonstration. See how the new F7 can handle your packaging operation at a greater profit. Or, return the coupon for full facts.

A HALF DOZEN WAYS



THE F7 CAN LOWER

PACKAGING COSTS

ACME STEEL

IDEA LEADER IN **STRAPPING**

ACME STEEL COMPANY
Dept. FAS-41, 135th St. & Perry Ave.
Chicago 27, Illinois.

☐ I would like an F7 demonstration in my plant.
☐ Send complete information on the new F7.

NAME_____

TITLE_____

FIRM_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

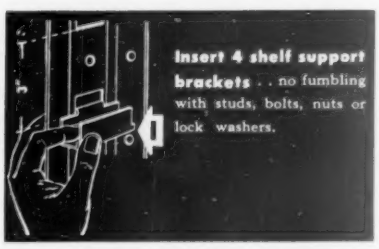
don't lose a real opportunity to have the best shelving . . . SPECIFY

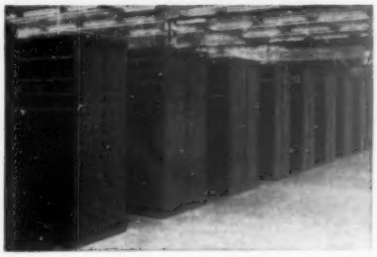
BORROUGHS STEEL SHELVING

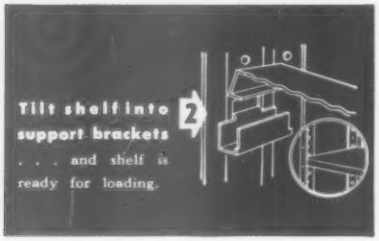
the tough and rugged shelving that will last a long, long time!

JUST SAY "BORROUGHS" when you request steel shelving for your factory. That one word, "BORROUGHS", tells a mighty big story of value. "BORROUGHS" means you have shelving that cannot be surpassed for simplicity of design — ease of assembly — speed of adjustability — economy of installation. Entire units can be assembled without special tools — shelves can be installed or adjusted without nuts or bolts — each unit is complete in itself and can be moved without disturbing other units. If you can arrange to see a Borroughs shelving installation "at work", do so by all means. There's no better way to get first-hand proof of Borroughs' superiority. The next best way is to send for Borroughs' catalog . . . it's full of facts!

most simple, most adjustable, most rapidly assembled line of shelving on the market







send for catalog

Represented in Sweet's Catalog, Plant Engineering File 4G BO

BORROUGHS MANUFACTURING COMPANY OF KALAMAZOO

A SUBSIDIARY OF THE AMERICAN METAL PRODUCTS COMPANY OF DETROIT

3020 NORTH BURDICK ST. amp KALAMAZOO, MICHIGAN

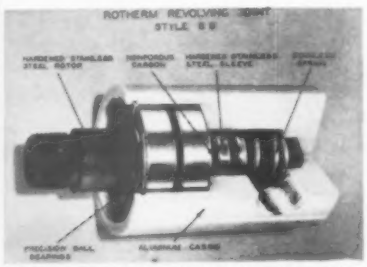
FACTORY / EQUIPMENT NEWS

Begins on page 104

For more about these items, circle item numbers on Reader Service Card next to back cover.

112—Airless pump, when teamed with standard airless spray gun and medium production cap, makes low-cost finishing system. Portable 17-lb. unit consists of lid, 5-gal. container, handle. Sprays most paints. Operates with as low as 1-hp. air compressor. *DeVilbiss Co.*

113—Infrared comfort heaters with deep housing shells aim heat directly at target. Good for high and out-of-the-way mounting over work area. Electric Chromalox units come with metal sheath, quartz tube or lamp elements, 8- to 54 $11/16$-in. models. *Edwin L. Wiegand Co.*



114—Revolving joint handles 500 lb. of air or hydraulic pressure with minimum of friction at 1500 rpm. Rotates on two precision ball bearings. Stainless steel is used for rotor, sleeve and spring to insure long life. Aluminum joint casing. *Rotherm Engineering Co.*

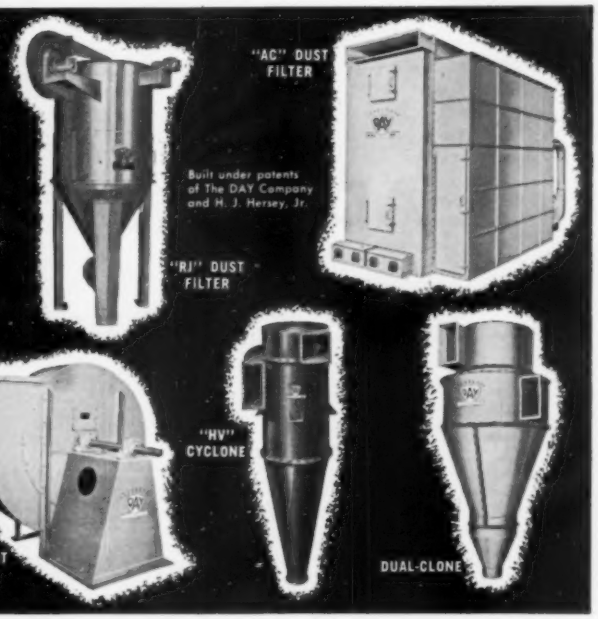
Turn the page

DAY "RJ" dust filters and Dual-Clones on roof of Andersen Corporation *Windowall* plant, Bayport, Minn. This plant has 17 DAY dust collecting systems which include 21 DAY "RJ" dust filters, 20 DAY exhaust fans, 15 DAY Dual-Clones and more than one-half mile of piping. Over 50 tons of dust are removed via DAY systems each day. DAY equipment is flexible and easily adapted to changes in plant layout.

DUST CONTROL

THE WAY YOU LIKE IT!

- *Efficient*
- *Trouble-free*
- *Economical*



No two dust problems are identical . . . that's why it will pay you to consider DAY *engineered dust* control. Laboratory research, 80 years of practical experience and a *guaranteed approach* to efficient dust control are some of the reasons why companies of every size decide on DAY dust control. DAY offers a *complete* line of dust control equipment . . . seven types of collectors or filters — 166 different models . . . one is sure to solve your dust problem exactly, efficiently and economically.

Complete DAY service includes:

1. A field survey of the problem
2. A recommended solution
3. An engineered layout of equipment and/or system
4. Fabrication of equipment, piping, suction hoods, etc.
5. Installation
6. A GUARANTEE OF RESULTS

Whether you need equipment only or a complete system — contact DAY

FREE! HELPFUL, DETAILED INFORMATION ABOUT DAY Dust Control. Check and mail coupon toDAY. You'll receive free folders about DAY dust control equipment.

DAY SINCE 1881

equipment only or a complete system

CLIP AND MAIL COUPON TODAY

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In CANADA
The DAY Company of Canada, Ltd.
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Please send information on:

☐ "RJ" Dust Filter ☐ "AC" Dust Filter ☐ Exhausters ☐ "HV" Cyclones ☐ Dual-Clone

NAME_____

COMPANY NAME_____

ADDRESS_____

CITY_____ STATE_____

NOW!

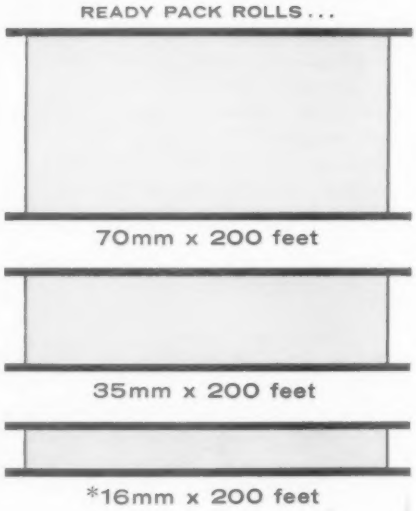
READY PACK IN ROLLS...

Kodak Industrial X-ray Film, Type AA and Type M in 16mm, 35mm and 70mm widths, 200-foot lengths

Here is America's preferred Industrial X-ray Film in a new convenient form—in 200-foot rolls, and in three widths. Ready Pack rolls are the answer for panoramic or moving slit methods of radiography of thin-wall vessels and pipe, honeycomb, circumferential welds, etc. Unroll the needed film, cut it off, seal the ends with opaque, pressure-sensitive tape. You are ready to inspect aluminum or magnesium alloys, thin steels or anything where lead screens are not required.

Ready Pack rolls are supplied on cardboard cores, 12 inches in diameter. The film is enclosed in a light-tight wrap-around sealed covering, without interleaving paper. It keeps clean and does away with darkroom loading. For processing, just separate the wrap along the sealed edge and remove the film.

For further information or to order a supply, contact your x-ray dealer or write us for a Kodak Technical Representative to call.



*For the present this size available only on a special order basis.

EASTMAN KODAK COMPANY
X-ray Sales Division, Rochester 4, N.Y.

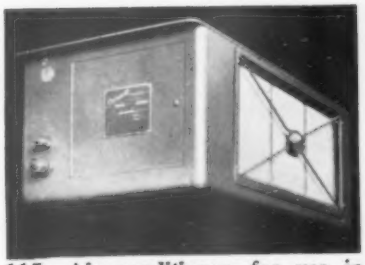
Kodak
TRADE MARK

For more facts Circle 454 on Reader Service Card

FACTORY/EQUIPMENT NEWS

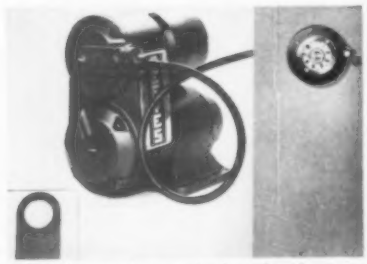
Begins on page 104

For more about these items, circle item numbers on Reader Service Card next to back cover.



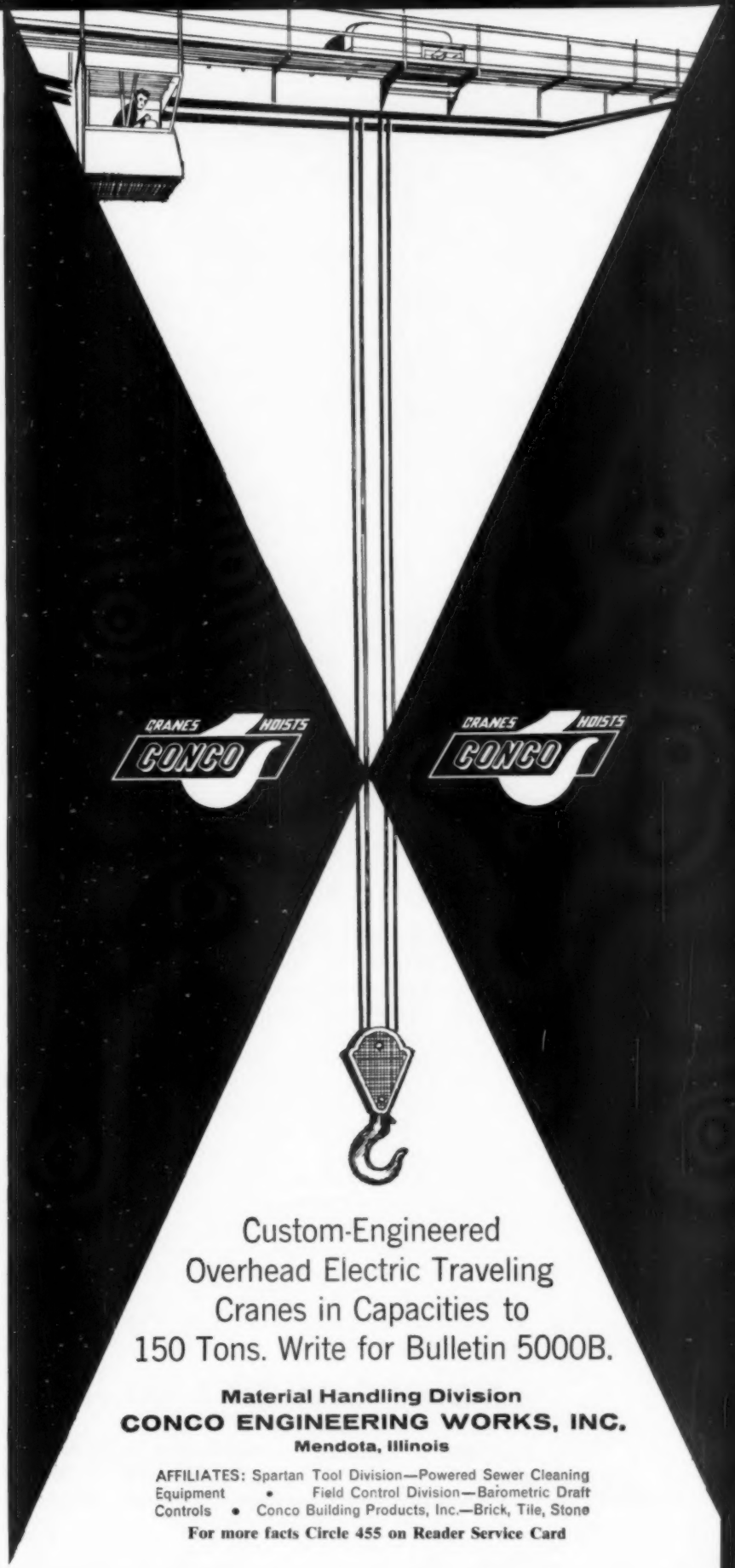
115—Air conditioner, for use in high-ambient temperatures to 180 F., heats in winter, cools and dehumidifies, and removes dirt, odors, and noxious fumes. Compact (41½x21x15 in.) ceiling-mounted unit has heating capacity of 13,600 Btu. per hr. *Correct-Air Corp.*

116—Trap-filter combination, for lines carrying liquids or slurries, removes both ferrous and non-magnetic particles. Trap is quickly removed from housing (inset) for easy cleaning. Tube magnet (photo) catches particles. For lines of various sizes. *Eriez Mfg. Co.*



117—Remote control unit changes output speed of company's variable-speed, ¼ to 2 hp., Motodrives. Has anti-backlash shaft, and indicator handwheel manually turned to change speeds. Special shaft lengths for inaccessible places. *Reliance Electric & Engineering Co.*

Turn the page



Custom-Engineered
Overhead Electric Traveling
Cranes in Capacities to
150 Tons. Write for Bulletin 5000B.

Material Handling Division
CONCO ENGINEERING WORKS, INC.
Mendota, Illinois

AFFILIATES: Spartan Tool Division—Powered Sewer Cleaning Equipment • Field Control Division—Barometric Draft Controls • Conco Building Products, Inc.—Brick, Tile, Stone

For more facts Circle 455 on Reader Service Card

fast, low cost erection
self-supporting
long life:

Four of 19 conveyors for ore, coke, and other sintering materials installed for the new sintering plant at the Aliquippa Works of Jones & Laughlin Steel Corporation. All of the 3032 linear feet comprised are protected with EGSCO conveyor hoods of galvanized steel.

EGSCO® CONVEYOR HOODS
of curved, corrugated sheet metal

TYPICAL EGSCO SHEET CURVES

Complete weather-protective covering for outdoor conveyor belts, their load and their supporting idlers and drive mechanisms is economically provided by the EGSCO hood of curved, corrugated metal. The arch eliminates center supporting structural steel, as well as flashing at ridge and eave. Its simplicity results in substantial savings in materials and erection manhours.

In addition to the fixed hood, EGSCO hoods are also designed with three types of hinged arrangements for inspection and conveyor maintenance access. These include individually hinged, curved sections or hinged access doors.

EGSCO factory-curved sheets are obtained in any of the combinations of arcs and tangents, illustrated at the left, for conveyor hoods or other structural or architectural use.

Conveyor hoods or curved sheets are formed of galvanized or aluminized steel, or of aluminum, and obtainable in standard or V-beam corrugations. Architectural, baked-on colors are available if desired. For complete description, details and specifications see Sweet's Industrial Construction File 8b/Smt, or write for Bulletin 61W.

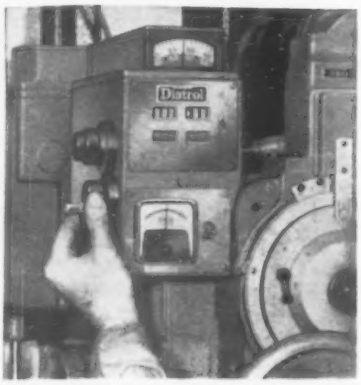
ELWIN G. SMITH & CO., INC.
PITTSBURGH 2, PA.
BOSTON • CHICAGO • CINCINNATI • CLEVELAND
DETROIT • NEW YORK • PHILADELPHIA • TOLEDO

For more facts Circle 456 on Reader Service Card

FACTORY / EQUIPMENT NEWS

Begins on page 104

For more about these items, circle item numbers on Reader Service Card next to back cover.

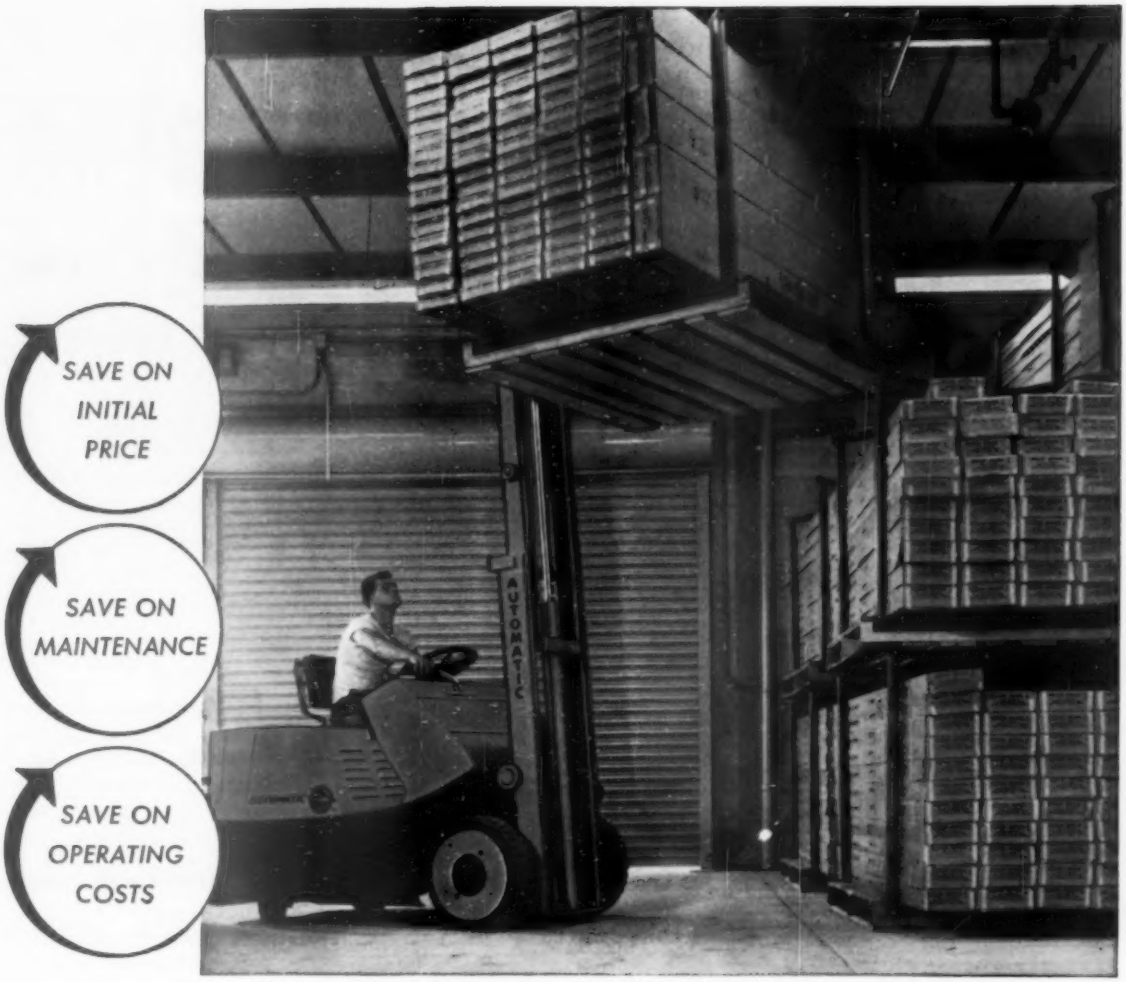


118—Jig-borer control allows dialing-in, directly from a print, preselected plus and minus dimensions for vertical or horizontal positioning. Pushbutton automatically positions table and head in seconds. System includes direct-reading dials (photo). *DeVlieg Machine Co.*

119—Mass flowmeter system has no obstructions—unaffected by viscosity, pressure, temperature or pipe size. Accurate to ±1.5%; has many applications. Consists of flowrate meter, density detector, and readout unit. Little maintenance. *Fischer & Porter Co.*

120—Service entrance switch-fuse combination power protectors open all contacts when one fuse blows. Indicator shows blown fuse. Contacts cannot be re-closed until fuse is replaced. Interrupts 200,000 amp. Rated 480 v. a-c, 800 to 4000 amp. *General Electric Co.*

Turn the page



EASE THE PROFIT SQUEEZE WITH AN AUTOMATIC® GAS LIFT TRUCK

A truck that's down for repairs costs plenty. So does one that gulps fuel. AUTOMATIC's answer: a truck with no clutch to shift or wear out, no complicated torque converter to breakdown . . . a truck that saves you up to 30% on fuel . . . and yet costs no more to buy.

With as many as 200 fewer wearing parts compared to conventional power shift units, the danger of unexpected downtime is practically eliminated. So is the cost of complex and frequent repairs. An AUTOMATIC *gas* truck means less maintenance . . . easier maintenance.

Cutting fuel bills, while at the same time increasing output, is another profit-saver. AUTOMATIC's high efficiency transmission gives higher torque while moving more tonnage per hour with less fuel.

Check initial cost. AUTOMATIC's gas lift truck is priced competitively to all other trucks of the same capacity equipped with automatic transmission.

It's a sound formula to combat the profit squeeze: save on initial cost, save on maintenance, save on operating costs.

Capacity with cushion rubber tires, 3000 to 10,000 lbs., pneumatic tires, 3000 through 8000 lbs.

AUTOMATIC

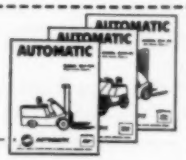
AUTOMATIC TRANSPORTATION COMPANY
Division of The Yale & Towne Manufacturing Company

39 West 87th Street, Dept. D1, Chicago 20, Ill.

FIRST IN IMAGINATION
FIRST WITH REALITY

WRITE FOR DESCRIPTIVE LITERATURE

Please send full details on Automatic Gas-Operated Lift Trucks:



Name_____

Firm_____

Address_____

City_____ Zone_____ State_____

12 NEW GRINDERS in a power range all their own!

Now! You can choose the abrasive tools that best fit your needs from 138 sizes and types of Ingersoll-Rand Grinders.

features

- **Sensitive Weight-Type Governor**—prevents overspeeding, assures positive, accurate speed control.
- **Improved Muffling**—15 decibels quieter than comparable tools.
- **Built-In Lubricator**—automatic motor lubrication increases tool life.
- **Built-In Air Strainer**—protects motor.
- **Rubber-Faced Throttle Valve**—unaffected by moisture, dirt and rust.

New Series 15 Grinders

- **Speed—6000, 9000, 12000 and 15000 rpm**
- **Weight—6½ lbs.**
- **Length—16⅝ ins.**
- **Grip or straight handles with lever or thumb throttles**

Twelve new Ingersoll-Rand grinders in a completely new size and power range! These small, high-performance grinders are specifically designed to fill the need for light weight, easy-handling tools that will hold their speed under load on a wide variety of difficult grinding and buffing jobs.

Series 15 Grinders fill the bill—and offer manufacturers important new proof of tools to increase Annual Dividends on Payroll Dollars.*

215A-8

* Ask your AIRengineer for a convincing on-the-spot demonstration of how these new grinders—as well as all other Ingersoll-Rand air tools—can earn an Annual Dividend on your Payroll Dollars.

Ingersoll-Rand
11 Broadway, New York 4, N. Y.
Planned Annual Retooling increases output per man

For more facts Circle 458 on Reader Service Card

FACTORY / EQUIPMENT NEWS

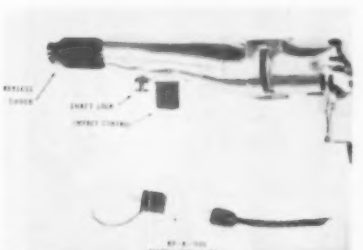
Begins on page 104

For more about these items, circle item numbers on Reader Service Card next to back cover.

121—Dust-free cabinet, 22x35x29 in., has filter to remove dust particles down to ½ micron. Made of clear plastic, it is shadow free—light enters from all directions. Blower automatically starts up when cover is removed. For assembly or repair work. *Plastigage Corp.*

122—Heat-treating system, in complete package, provides automatic "straight-through" operation from loading to quench. For carbonitriding, carburizing, bright-hardening, annealing, normalizing, brazing of metals to 1850 F. Gas-fired or electric. *Hevi-Duty Electric Co.*

123—Round-chart controllers, in two lines, have hinged cabinets for easy servicing. Temperature indicators and programers, in many models, control any variable resolvable into mv. signal. Both are highly accurate precision instruments. *Barber-Colman Co.*



124—Rotary-impact drill uses any standard carbide bits to make ¼- to 4½-in. holes in concrete, brick, and tile 40% faster than comparable units. Impact force comes from within drill, not from operator pressure. Knob converts it to conventional rotation. *Roto-Pak, Inc.*

Turn the page

SELF-PROPELLED K-4 removes traffic-packed dirt in 1 operation. Operator merely guides it.

removes 2 tons of incrusted grime in less than 8 hours

New self-propelling TENNANT Model K-4 Floor Machine shears off and picks up hard-packed layers of grease-caked dirt *in one operation.* Lets one man do a faster, cleaner job than a 6-man crew with hand scrapers!

Machine does all the work—you simply guide it. Propels itself forward . . . reverses instantly at touch of a lever. Propels itself back over pulverized path for extra-clean "whisk-broom" type pick-up. *Easier than ever to use.*

Has many new features—30% larger envelope-type, vacuumized filter (over hopper) for better dust control . . . new longer-wearing wire brush . . . 28% more powerful engine—plus many other cost-saving features.

Terrific cleaning power—Can remove over 2 tons of traffic-packed dirt per shift . . . shears off tough build-up other methods can't touch. 1725 rpm tool cleans a 16" path lightning fast. No hand-scraping, no chemicals, soap or water. Leaves floor clean, dry and hump-free, ready for immediate, faster traffic. *Before-and-after photos below are graphic proof of dramatic results.*

BEFORE—Heavy grease-caked grime on wood block floor in busy aisle "drags" at truck wheels . . . slows traffic to a crawl.

AFTER—High-speed K-4 instantly pulverizes and picks up tough, heavy dirt . . . cleans right down to floor surface.

WRITE TODAY *for illustrated bulletin, photos and performance data.* G. H. Tennant Co., 705D No. Lilac Drive Minneapolis 22, Minnesota.

TENNANT

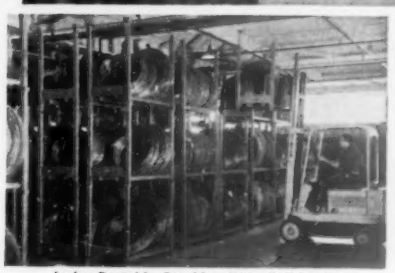
HEAVY-DUTY
FLOOR
MACHINES

SPECIALIZED MAINTENANCE EQUIPMENT

POWER SWEEPERS • FLOOR MACHINES • SCARIFIERS • ROOF SCRAPERS • CONCRETE ROUTERS

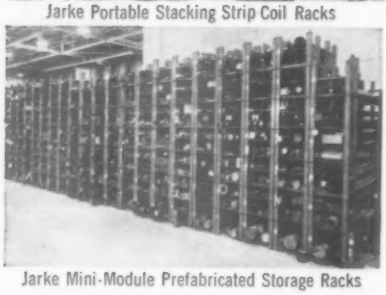
For more facts Circle 459 on Reader Service Card

JARKE Modular Storage Systems *Pay Off in Cash!*



Jarke Portable Stacking Wire Coil Racks

Jarke Portable Stacking Strip Coil Racks



Jarke Mini-Module Prefabricated Storage Racks

Inefficient storage methods can be very expensive. You may be wasting valuable floor and air space. Now is the time to put a stop to such extravagance . . . install a modern Jarke Stock Storage System engineered to your specific requirements. Let a trained Jarke expert make a cost-free analysis of your present storage methods. Odds are . . . he will turn your storage losses into real cash profits. Write today.

Jarke can solve difficult storage problems quickly

JARKE MANUFACTURING COMPANY

6333 HOWARD STREET
CHICAGO 48, ILLINOIS

An Orderly Plant is a Profitable Plant

FACTORY/EQUIPMENT NEWS

Begins on page 104

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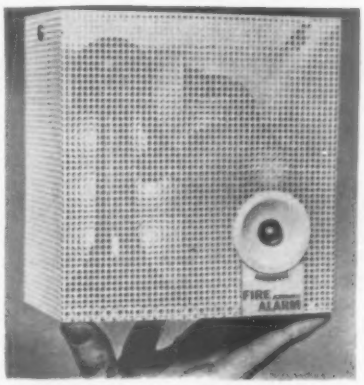


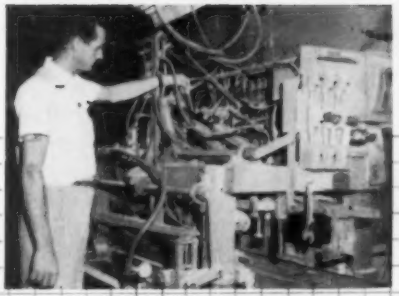
125—Automatic fire alarm sounds 12- to 15-min. blast audible for ½ mile. Compact Freon-activated unit has monitor to show liquid level in cylinder. Reddi-Eye comes in 136 and 174 F. ratings for areas with heat below and over 100 F. *Standard Fire Alarm & Signal, Inc.*

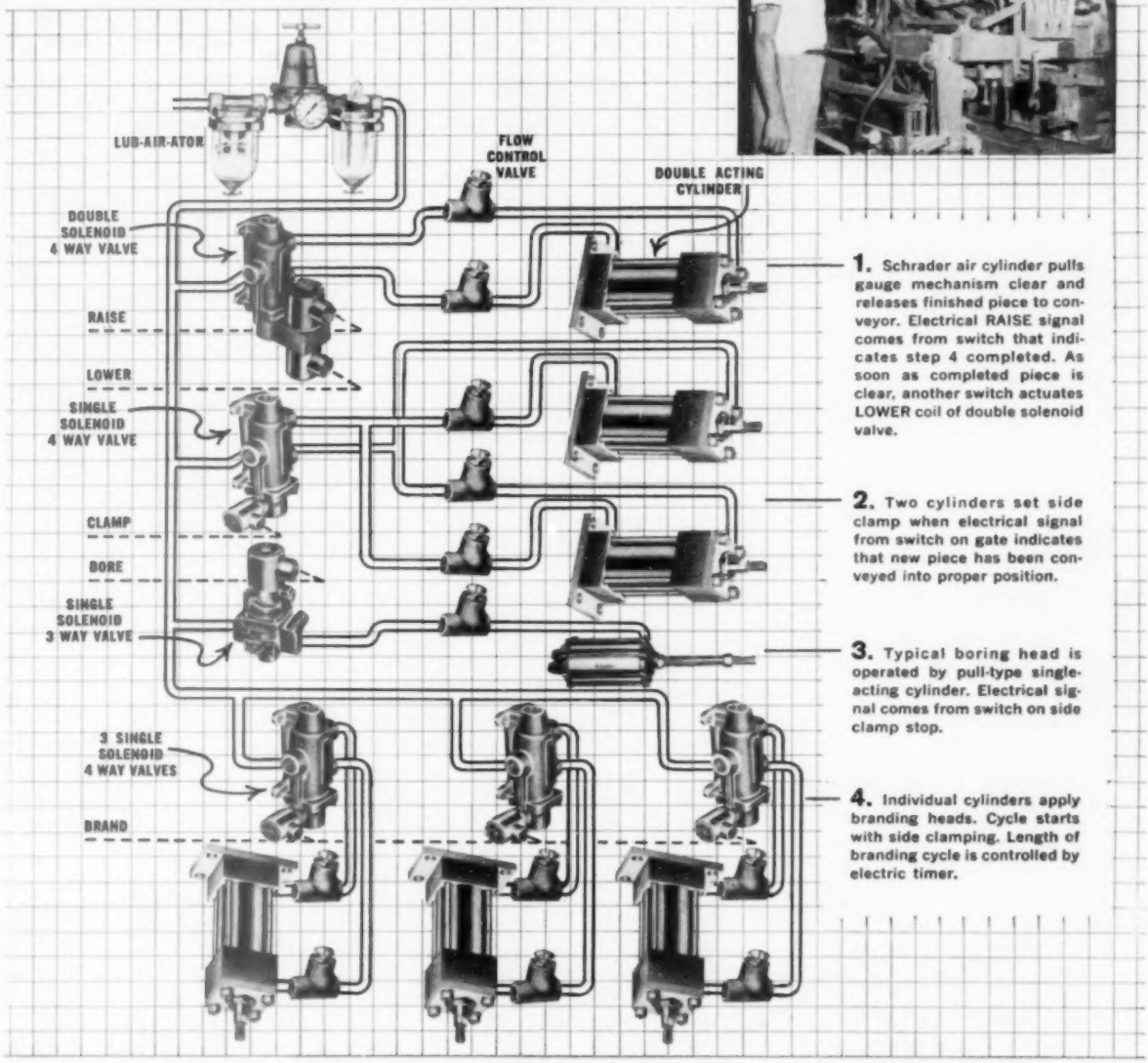
126—Wrap-around heaters, metal-clad resistance type, are for preheating, postheating, and stress relief. Built-in thermostats. Temperatures to 1400 F. Heatrol models include 12- to 36-in. strip heaters and 3-in. diameter pipe heaters. *J. B. Nottingham & Co.*

127—Shock absorber uses liquid (instead of gas or air) to provide full dampening. Stops fully loaded freight car going 12 mph. without impact. Has 8-ton pre-load spring force with 16-ton endload for restoring position. Uses under 4 gal. liquid. *Taylor Devices, Inc.*

Turn the page

The Lane Furniture Company of Altavista, Virginia, broke its cedar chest production line into groups of operations for air-automation. One of the many circuits, shown here, was designed with quality Schrader components to brand the chest tops with a trademark, bore hinge recesses, and perform vertical and horizontal gang drilling operations. All three jobs are completed in less than 30 seconds!





1. Schrader air cylinder pulls gauge mechanism clear and releases finished piece to conveyor. Electrical RAISE signal comes from switch that indicates step 4 completed. As soon as completed piece is clear, another switch actuates LOWER coil of double solenoid valve.

2. Two cylinders set side clamp when electrical signal from switch on gate indicates that new piece has been conveyed into proper position.

3. Typical boring head is operated by pull-type single-acting cylinder. Electrical signal comes from switch on side clamp stop.

4. Individual cylinders apply branding heads. Cycle starts with side clamping. Length of branding cycle is controlled by electric timer.

MANUFACTURER AUTOMATES PRODUCTION LINE WITH SCHRADER AIR CIRCUITRY... COMPLETES 3 JOBS IN 30 SECONDS

If your plant has production lines too long, unwieldy and costly to compete effectively, take a tip: Break your entire manufacturing sequence into logical *groups* of jobs. Then develop air-powered and air-controlled machines to perform each group in sequence. This company did, and now has versatile, fast, and economical production. *You already have air.* Expand its uses with versatile Schrader Air Products and discover true efficiency.

There is a fully stocked Schrader Distributor nearby . . . staffed with experts to help you solve any air circuitry problem. Consult the Yellow Pages or write:

Schrader®
a division of SCOVILL

A. SCHRADER'S SON
Division of Scovill Manufacturing Company, Incorporated
457 Vanderbilt Avenue, Brooklyn 38, N. Y.

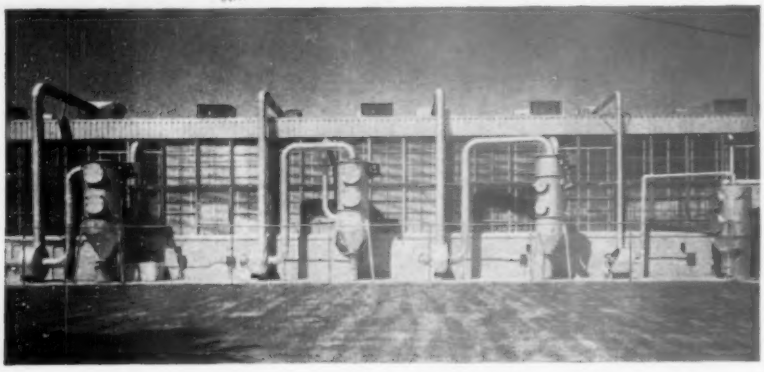
QUALITY AIR CONTROL PRODUCTS

For more facts Circle 461 on Reader Service Card

HERE...Critical Nature of the Application*

...Suggested Selection of a

SPENCER VACUUM SYSTEM



*Machining beryllium poses many serious problems—all related to the toxic nature of beryllium dust.
Recognizing the dangers, Speedring Corp., manufacturers of high precision beryllium instrument parts, specified Spencer vacuum systems which provide:

- ✓ **Pressurized Pickup**—High velocity hoods are tied into the vacuum system at all points where chips or dust are created.
- ✓ **Complete Containment**—Chips and dust are carried off through a "sealed" system . . . cannot escape back into the air.
- ✓ **100% Separation**—Spencer's positive action centrifugal separators—equipped with Cambridge Absolute® filters on the exhausts—assure complete removal of any toxic traces before air is exhausted.

Request catalogs No. 155B "Spencer Vacuum" and No. 143B, "Pneumatic Conveying".

ALSO MANUFACTURERS OF PORTABLE VACUUM CLEANERS

The SPENCER TURBINE COMPANY
HARTFORD 6, CONNECTICUT

FACTORY/EQUIPMENT NEWS

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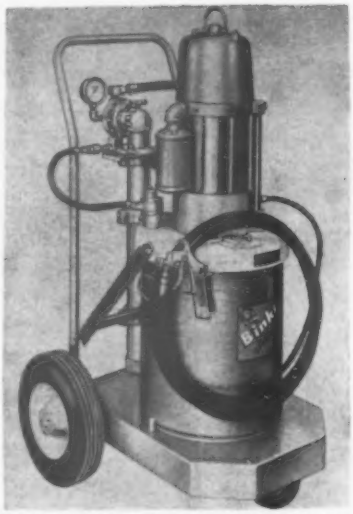
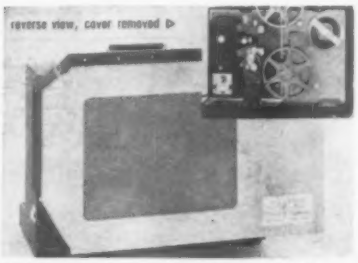
For more about these items, circle item numbers on Reader Service Card next to back cover.



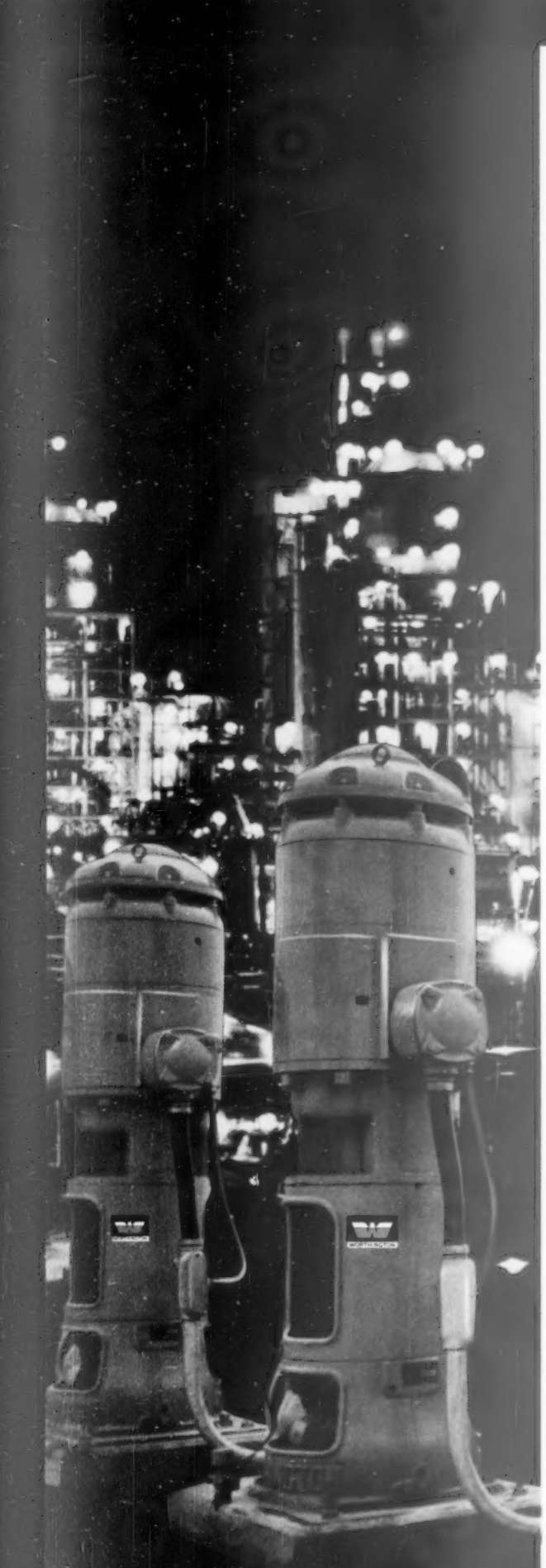
128—Mobile airless spray, with 21-to-1 pump, provides output pressures as high as 3000 psi., flows to 2½ gpm., to feed up to four guns. Pacer Hi-Volume maintains constant and uniform output pressures to each gun, with variation between guns held to minimum. *Binks Mfg. Co.*

129—Air-handling troffers, for drop ceilings, provide light, and cool or warm air from single concealed fixture. Glass fiber isolates air passageway from housing to prevent heat variations affecting light output. One unit handles to 200 cfm. *Thomas Industries Inc.*



130—Movie projector, for 8mm. sound film, comes in portable case with built-in 9x12 projection screen. Achieves 500x magnification. High light output ideal for brightly lighted areas. Comes with 400 ft. reels; larger ones, for 40 min. of projection, optional. *Vicom, Inc.*

Turn to page 129



Up to 4% more efficient...it costs less to operate vertical pumps with UHF design

Yes, UHF design in vertical pumps produces a new higher performance level. So high, in fact, that your power saving is frequently equal to one hour of free operation in each twenty-four.

Here's how UHF design achieves this new level in vertical pump performance . . .

Higher efficiency over wider operating range cuts power costs . . .

Today Worthington UHF design gives unexceeded—frequently unequalled—peak efficiency. This alone cuts your power costs sharply. But most important, the peak of a UHF-designed efficiency curve is broader . . . flatter on top. This cuts costs by maintaining a much higher average efficiency over the normal fluctuations in system capacity and head.

Look at the chart at the right, comparing an ordinary pump with UHF design. The efficiency of the UHF-designed pump remains higher through a much broader range of the head-capacity curve. Or, at any given operating point away from peak, its efficiency will exceed that of the ordinary pump. Either way you save appreciably on power.

UHF design most closely covers system requirements

The UHF line covers every design point with not one, but three or more performance curves. This fully recognizes requirements of different systems. And it assures you of more satisfactory, more economical performance.

Here's how. In the chart at the right, the UHF-designed pump covers the design point with three different head-capacity curves. Pump "A" maintains relatively constant flow in spite of pressure changes. Its curve is typical of those required, for example, by circulating water pumps from which a constant flow is required, regardless of pressure changes.

On the other hand, pump "C" might serve a municipal water supply. There a relatively constant pressure is required despite variations in demand. Pump "B" is suitable for intermediate requirements.

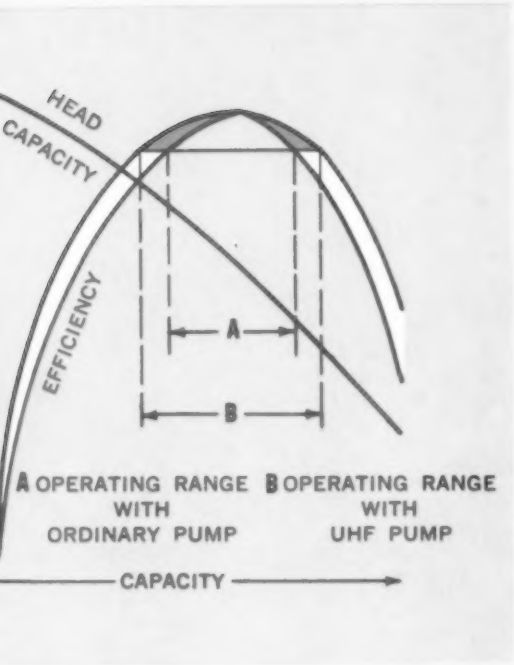
What is the cost saving?

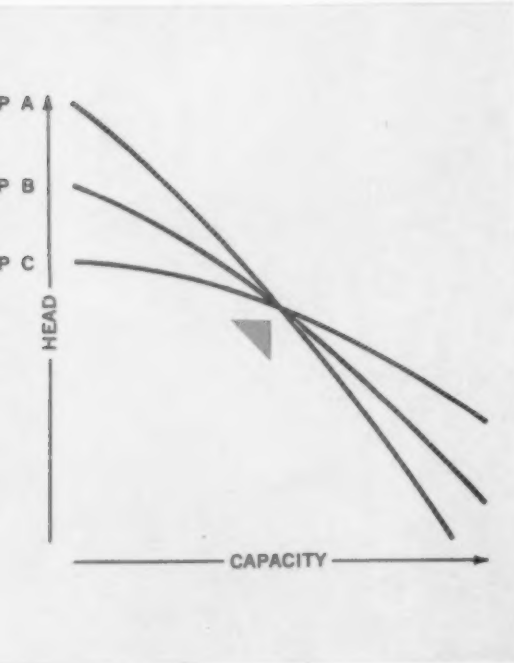
If UHF design gives you as little as a 1% increase in average efficiency during an 8,000-hour year, you will save: $200 on a 124 hp pump; $560 on a 350 hp pump; and $800 on a 500 hp pump.

PUMP A

PUMP B

PUMP C





NEW VERTICAL PUMP WITH UHF* DESIGN

RUNS FREE ONE HOUR EACH DAY

*ULTRA HIGH FLOW

UHF-designed pumps run longer with higher sustained performance

Peak efficiency at start-up is just the hydraulic half of the UHF design story. The construction is extremely important, too, because UHF design means less taper-off in pumping efficiency during operation, and reduced maintenance.

For example, you'll find UHF shafts are frequently 10 to 40% heavier than competition. Thus even at maximum horsepower, shaft and bearing wear is negligible in UHF pumps.

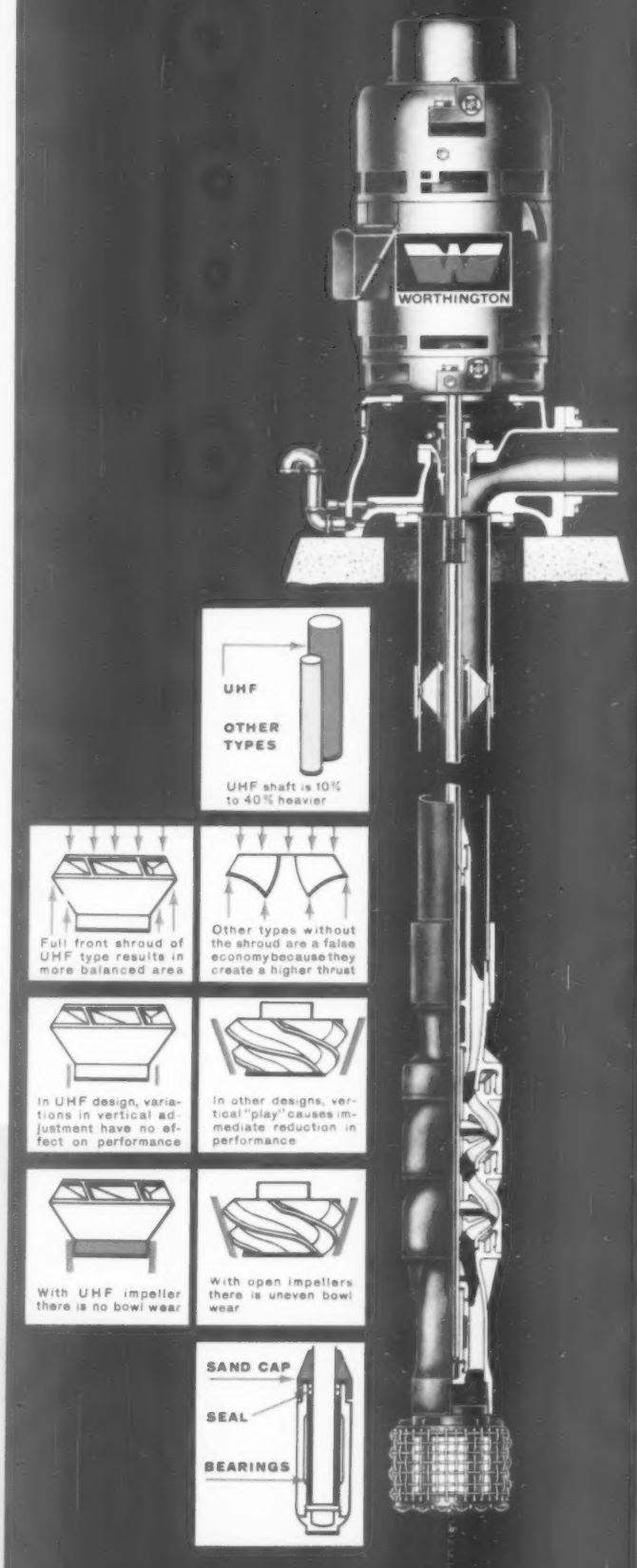
Another major design advantage is in impellers. The closed impellers used in UHF pumps reduce axial thrust by about 50% over open impellers. This greatly reduces thrust bearing loads, extending bearing life.

Still another UHF impeller advantage is its single replaceable wearing surface. Open impellers wear against the non-replaceable bowl face and on exposed impeller vane edges. Re-machining in these pumps narrows the waterways, making it impossible to restore new-pump performance. On the other hand, UHF performance can be re-established by cleaning up the impeller skirt slightly and inserting an inexpensive seal. The UHF pump becomes as good as new.

Still another advantage is that UHF impeller design reduces performance-damaging shaft stretch, because of lower axial thrust. And with the closed impeller, performance does not vary with end play, while open impeller performance suffers directly from varying clearances.

In UHF pumps on abrasive service, you'll find exclusive Neoprene seals on the suction bearing. This greatly lengthens suction bearing life . . . most other pumps have sand caps only—or no bearing protection at all.

These are just some features of UHF design that make UHF pumps run longer—more economically. There are, of course, all the standard design variations, such as seals and materials, necessary for any special application.


WORTHINGTON
UHF
OTHER TYPES
UHF shaft is 10% to 40% heavier
Full front shroud of UHF type results in more balanced area
Other types without the shroud are a false economy because they create a higher thrust
In UHF design, variations in vertical adjustment have no effect on performance
In other designs, vertical "play" causes immediate reduction in performance
With UHF impeller there is no bowl wear
With open impellers there is uneven bowl wear
SAND CAP
SEAL
BEARINGS

WORTHINGTON CORPORATION, Dept. 24-5, Harrison, N. J.

Please send me your bulletin(s) on:

_____ UHF Vertical Industrial Pumps
_____ UHF Vertical Municipal Pumps
_____ UHF Vertical Industrial Can Pumps
_____ UHF Submersible Pumps
_____ UHF Well Service Pumps
_____ I would like a representative to call.

NAME_____

COMPANY_____

STREET_____

CITY_____ STATE_____

Qualified local services deliver full benefit of UHF design

Traditionally the vertical pump has been for well use—and for this work the UHF design will produce new low-operating and maintenance costs.

But the most significant recent advance in pump engineering is the use of the vertical pump in transfer and loading, in booster service—in every application where there are suction and/or space problems. These engineers are finding four inherent advantages.

First, the vertical pump saves valuable floor space. Second, it eliminates all suction piping and elaborate pit construction. Third, it provides a simple solution to any suction problem, cutting installation and operating costs. And fourth, the vertical pump is uniquely adaptable to changing conditions, by changing the number of impellers, modifying them, or adding or removing stages.

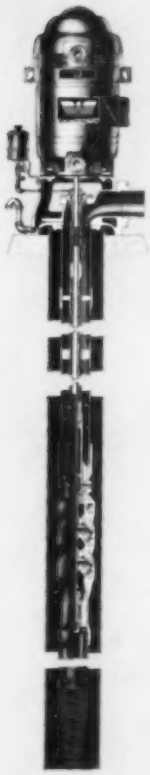
You will get full benefits of UHF design by working with Worthington distributors. They provide important services in three major areas.

First, he is competently staffed to help your engineers with application and layout designed for your particular requirements. Second, he can take full responsibility for installation, including housing, wiring, wells, pipeline and in supplying allied equipment, if you wish it. And finally, the distributor provides competent emergency service for repairs and repair parts, as well as handling your routine maintenance.

For more information about UHF design and the pump types shown, check the bulletin you want on the reply form and mail it today. You'll find your Worthington representative listed in the Yellow Pages. Or for further information write to Vertical Turbine Pump Division, Worthington Corporation, Denver, Colorado.

WORTHINGTON

PRODUCTS THAT WORK FOR YOUR PROFIT

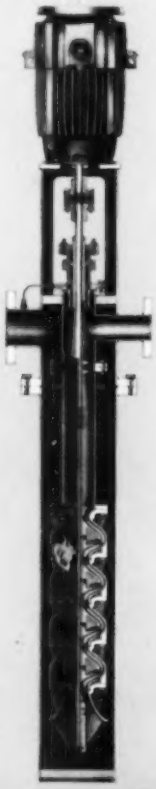


UHF WELL PUMPS for any industrial or municipal shallow or deep well task.

UHF VERTICAL INDUSTRIAL PUMPS with special hydraulic and mechanical design for industrial service.

UHF SUBMERSIBLES for concealed, quiet installations and special deep well applications.

UHF CAN PUMPS for handling critical NPSH problems and simplifying installations.



FACTORY/EQUIPMENT NEWS

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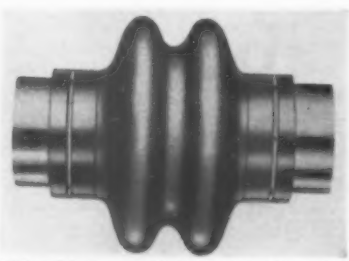
For more about these items, circle item numbers on Reader Service Card next to back cover.

131—Limit switch, proximity type, senses ferrous and non-ferrous metals. Sells for about half the price of comparable switches. Simple design eliminates critical set-up adjustments. Pickup rejects metal chips, is unaffected by dirt, moisture. *Electronic Signals, Inc.*

132—Flexible rubber pipe, withstanding heats to 250 F., is particularly adaptable to dual hot and cold water circulating systems. Made of neoprene and Dacron in place of cotton duck. Comes in pipe sizes to 12-in. diameter, lengths to 9 ft. *General Rubber Corp.*



133—Universal joint, with oil-resistant neoprene cover, is pre-packed with grease. Resists dust and dirt. Good for use where lubrication is difficult. In ⅜ to 2½ in. OD., to 48,000 in.-lb. torque, to 230 hp., and speeds to 1750 rpm. *Lovejoy Flexible Coupling Co.*

Turn the page

12 REASONS...

. . . WHY IT PAYS YOU TO SPECIFY CINCINNATI CLOCK AND PROGRAM SYSTEMS

Only Cincinnati Time Recorder offers you all these features. It pays to compare . . . but it pays more to specify Cincinnati Clock and Program Systems because you get:

1. Time Systems covering any group of requirements . . . from basic clock and program control through the most exacting control, signalling and communications requirements.

2. Simplified program setting . . . push a roller on a pin. Both are re-useable and require no tools or special skills.

3. Minute-to-minute programming . . . individually calendared program circuits, with single knob control.

4. Entire system may be controlled or synchronized to exact time from the master unit.

5. Automatic hourly clock supervision . . . up to 58 minutes slow and 57 minutes fast . . . plus twice daily supervision with a 12 hour control range.

6. 12 hour spring reserve power . . . for continuous operation throughout line power failure.

7. Plenty of power . . . controls an unlimited number of secondary clocks.

8. Engineered simplicity . . . for lower installation cost and minimum service.

9. Simplified installation . . . surface or flush mounting with exclusive swing-out trunnion mounting for easy access.

10. All switches enclosed (dust and moisture free) snap-action type rated at 15 amps.

11. Rugged, U.L. Approved Construction . . . for safe, long life.

12. Nationwide service . . . more than 150 service locations.

Call your Cincinnati representative for a discussion of your particular application. Or, write for our Time Systems Handbook . . . an easy reading guide to good equipment.

THE Cincinnati TIME RECORDER CO.
1732 Central Avenue
CINCINNATI 14, OHIO
SINCE 1896

For more facts Circle 464 on Reader Service Card

USERS REPORT:

"Semi-live storage with FAIRBANKS lift jack platform trucks achieve greatest flexibility, fastest handling!"

Semi-live Lift Jack Platform Trucks and Jack Handles provide best storage control with fastest flow of parts, raw materials, semi-finished goods or finished merchandise. A few jack handles, strategically placed, handle any number of platforms—quick and easy. With no moving parts, jack handle instantly engages and disengages semi-live skid. A sure cost-cutter for warehouse use in handling commodities, in plants for processing of parts, and in freight terminals.

Series 500 Trucks
Seasoned oak, tongued and grooved platform strengthened by cross battens.
SIZES: 24" x 36" to 30" x 60"

Series 580 Trucks
Extra heavy duty. Steel-framed construction won't buckle even under uneven loading. Capacities to 4000 lbs., yet handles easily on wide spaced 8" load wheels. SIZES: 30" x 48" to 36" x 72"

Buy Through Distributors. Fairbanks products are stocked, sold and recommended by leading distributors in all the principal cities across the nation.

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Executive Office: 393 Lafayette Street, New York 3, New York
Valves • Dart Unions • Casters • Trucks • Wheels

520 Atlantic Ave. Boston 10, Mass. | 2600 S. Throop St. Chicago 8, Ill. | 393 Lafayette St. New York 3, N.Y. | 15 Stanwix St. Pittsburgh 22, Pa. | 202 Division St. Rome, Ga.

Factories — Binghamton, N.Y. and Rome, Ga.

For more about these items, circle item numbers on Reader Service Card next to back cover.

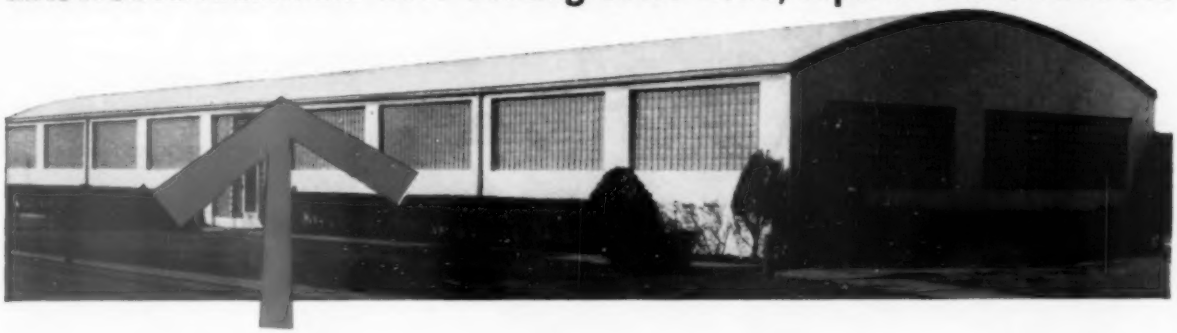
134—Image magnifier, for use with company's x-ray machine, permits non-destructive testing by enlarging 20 times original size. Especially useful to inspect miniature assemblies. Image shown on TV monitor or screen. Built-in operator protection. *Picker X-Ray Corp.*

135—Ultrasonic cleaner generates 120 watts of 90,000-cycle power (480-watt peak) yet costs only $220. System 80 has 1½-gal. tank, 12x6x6-in. working compartment. Eliminates need for automatic turning. Rated 117 v., 60 cycle a-c. *Ultrasonic Industries Inc.*

136—Pocket-size walkie-talkie, with telescoping antenna, has 1-mile range (limited by steel obstructions). Operates on Citizens' Band—requires no permit. Weighs 18 oz., costs under $50. Powered by 8 penlite batteries with 70-hr. life. *Lafayette Radio Electronics.*

Turn the page

MASTICOTE Aluminum Roof Coating cools attic, reports Sturtevant Co.



cooler in summer... warmer in winter... roof coating pigmented with aluminum

from ALCOA

The P. A. Sturtevant Co., Addison, Ill., corrected two problems connected with heat—and improved building appearance—with Masticote Aluminum Roof Coating, a product of Madison Paint Co., Cleveland, Ohio.

J. D. Esposito, purchasing agent, put it this way in his letter: "Prior to coating with Masticote we had quite a problem of heat absorption in the attic of our building in hot weather, and then heat loss during the winter months. Masticote Aluminum Coating changed both conditions . . . our attic is now decidedly cooler in summer and warmer in winter."

We've had similar reports from industries in all parts of the country. Independent tests have shown that a good aluminum coating will markedly reduce wide temperature variations under the roof . . . and cut maintenance costs.

Here's why. Aluminum coatings like Masticote combine pure ALCOA® Pigments in a tough asphalt-asbestos base. The aluminum "leafs" to form a brilliant, metallic top surface that protects the vital oils from the sun; keeps the coating pliant and waterproof. Reflective aluminum pigment turns back 70 per cent of the sun's heat; reduces inside temperatures.

ALCOA does not make aluminum roof coatings, but we will be happy to refer you to reputable manufacturers who do. Our booklets contain important information for every maintenance man. For your copies, please send the coupon.

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1750-D Alcoa Building, Pittsburgh 19, Pa.

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☐ *Painting With Aluminum*

☐ *Aluminum Roof Coatings Make Time Stand Still*

Name_____

Company_____

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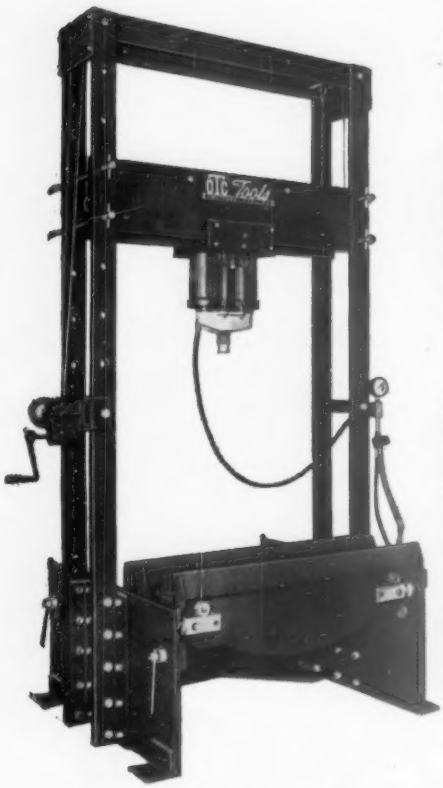
Unique OTC Roll-Bed Hydraulic Shop Press Positions Work Quickly, Easily:



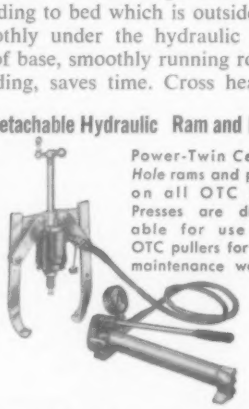
Bed is rolled *outside* the press frame to receive the unload hard-to-handle work.

One man easily rolls the bed and the work into position under the hydraulic ram.

Ideal for hard-to-handle work, the unique OTC *Roll-Bed* Hydraulic Shop Forcing Press permits overhead crane loading to bed which is outside the press frame — then work is rolled smoothly under the hydraulic ram. Unloading is just as easy. Rugged design of base, smoothly running rollers eliminates back breaking, dangerous loading, saves time. Cross head is adjusted to any height with winch — tapered pins lock it securely — trolley allows horizontal adjustment of ram for off-center work. Open sides admit long bars for straightening or bending. In 50 and 100 ton capacities, 8 ft. and 10 ft. high respectively, powered by manual or electric pumps. Other OTC Shop presses from 17½ to 50 ton capacities.

Contact your OTC distributor for further information, or write for Industrial Maintenance Catalog. No. P-9.

Detachable Hydraulic Ram and Pump



Power-Twin *Center-Hole* rams and pumps on all OTC Shop Presses are detachable for use with OTC pullers for other maintenance work.

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OTC

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399 CEDAR ST., OWATONNA, MINNESOTA

Designers and manufacturers of the world's most complete line of Maintenance Tools and Hydraulic Equipment.

PULLERS AND PULLER SETS · HYDRAULIC RAMS AND PUMPS · HYDRAULIC SHOP PRESSES · HAND TOOLS

For more about these items, circle item numbers on Reader Service Card next to back cover.

137—Dock extension platform permits trucks to back up flush to platform from either side. Simplifies narrow-aisle loading. Drawbridge-type hinge flattens platform against building when not in use. Power-hoist operated. Standard or custom sizes. *A A A Equipment Co.*

138—Intercom paging system uses 3-lb. battery-operated, transistorized transmitter ($445) completely independent of power supply. Provides communication with up to 15 pocket-sized receivers. Satisfies low - cost communication needs. *Multitone Electronics, Ltd.*

139—Plastic welding gun combines electric motor, air turbine, heating elements and jet in one compact tool. Needs no separate air supply. Plugs into outlet for fast, low-cost welding of vinyls, polyethylene, etc. Heat adjusts from 350 to 1000 F. *Weldotron Corp.*

Turn to page 136

"Puritan Engineered Maintenance boosted our cleaning standards 30%—reduced costs 20%!"

"We produce a line of highly sensitive electromechanical meter-relays, panel meters, and complete controls," says Mr. John Saint-Amour, President of Assembly Products, Inc., Chesterland, Ohio. "To maintain proper control over quality, our production and assembly areas must be as clean and as free of dust as possible. As a result, we have always placed unusual stress on maintaining good housekeeping and sanitation 'practices'."

"This is why we immediately recognized the advantages offered by Puritan Engineered Maintenance. It allowed us to put plant housekeeping on a scientific basis; spelled out how, when and where to do the job; gave direction to our cleaning operations; provided standards and instruction for our custodians; and it set up regular inspection procedures to keep our standards up to par."

"But the end results of Puritan Engineered Maintenance were even more gratifying. We've raised our existing levels of housekeeping one-third—have seen a startling increase in the efficiency of our custodial staff—and best of all, have accomplished all this at 20% less cost!"

Survey. In setting up Assembly Products' program, Puritan first made a detailed survey of the premises—pinpointed jobs to be done.

Program. A custom designed Engineered Maintenance Program was prepared. Details were explained to management and supervisors.

Training. Individual custodial responsibilities were explained. Training in scientific cleaning techniques was undertaken.

Inspection. Regular inspections spot trouble areas and uncover any other problems. Corrective measures can be undertaken immediately.

Whether your sanitation standards must be maintained at peak levels—or whether your operations simply call for normal, efficient housekeeping—chances are, you'll benefit from Puritan Engineered Maintenance. This unique service is available, without charge, to users of Puritan sanitary maintenance supplies. Why not get details today?

PURITAN CHEMICAL COMPANY

EXECUTIVE OFFICES: 916 ASHBY STREET, N. W. ATLANTA 18, GEORGIA

PLANTS AND WAREHOUSES: ATLANTA, GA. • HOUSTON, TEX. • ST. LOUIS, MO.

For more facts Circle 468 on Reader Service Card

PURITAN CHEMICAL COMPANY

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Send me a free copy of your 16-page booklet, ENGINEERED MAINTENANCE.

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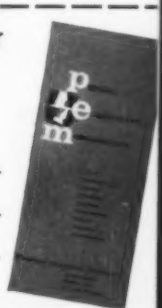
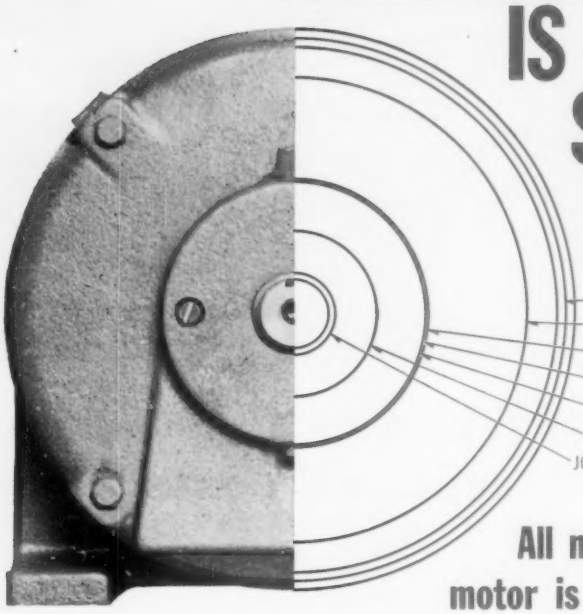


A MOTOR IS A SERIES OF CIRCLES



All must be ACCURATELY CONCENTRIC if the motor is to run smoothly, quietly, trouble-free

CONCENTRICITY of Elliott C-W Motors begins with the bracket-to-frame fit, the reference for all subsequent "circles." Bearing bore and shaft bore are precisely centered within this accurate diameter.

TOLERANCE of 0.0007 in. for the bearing bore is checked by an air gage after finishing in a precision lathe. Master jig assures accurate positioning of bearing, essential to uniform air gap.

Elliott Crocker-Wheeler integral-hp a-c and d-c motors—from smallest to largest—are offered in all conventional enclosures and modifications; with insulation to suit the application, including EPA SEAL epoxy insulation, for use where conditions are most severe.

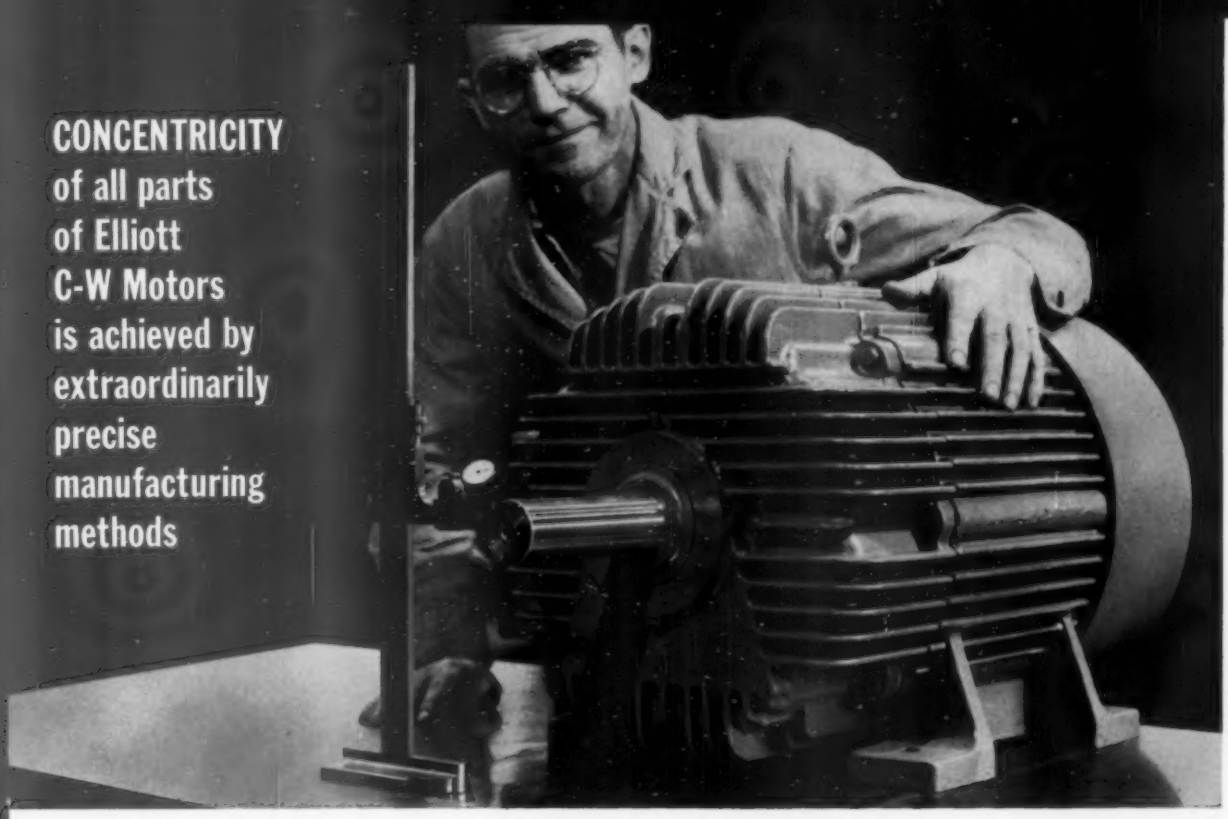
ELLIOTT COMPANY

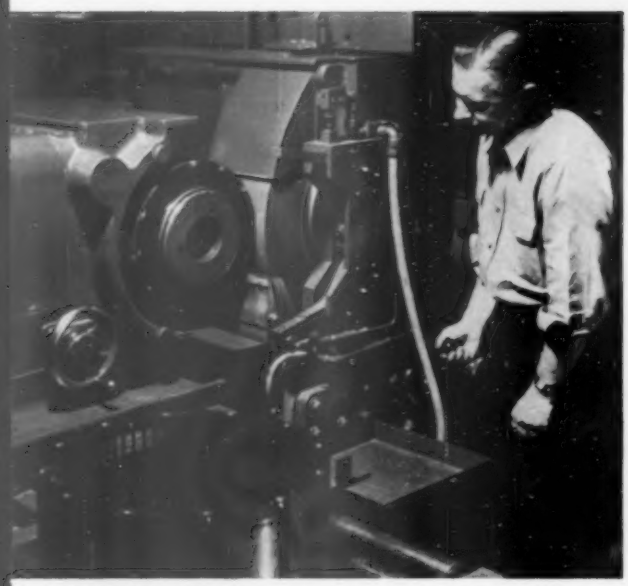
GENERAL OFFICES: JEANNETTE, PENNSYLVANIA

PLANTS AT: Jeannette and Ridgway, Pa.; Springfield, Ohio

TURBINES · GENERATORS · MOTORS · COMPRESSORS · TURBOCHARGERS · EJECTORS · STRAINERS · TUBE CLEANERS

CONCENTRICITY of all parts of Elliott C-W Motors is achieved by extraordinarily precise manufacturing methods





PRECISION GRINDER finishes the outer surface of the stator core to a tolerance of 0.001 inches. It is then pressed and keyed into stator frame, which has been finish machined concentric with the basic bracket-to-frame fit.

DUPLICATING the basic bracket-to-frame fit, a jig accurately positions the wound stator for finishing the inside core diameter by a "fly cutter," which corrects for all accumulated tolerances and assures precise concentricity.

Key manufacturing operations employed in maintaining the required close tolerances are described more completely in an interesting brochure, *The Fine Art of Building Better Motors.* We will be very glad to send you a copy.

For more facts Circle 469 on Reader Service Card

W1-2

F

ELLIOTT COMPANY, Jeannette, Penna.
Advertising Department

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TOTRUST
Instant Dry
METAL COAT
MACHINE GRAY
The fast-dry Prime and Finish to stop rust on new or rusted, damp or dry metal.
FOR MINIMUM-INTERRUPTION MAINTENANCE

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Stops Rust Better... Faster!

TOTRUST Instant Dry Protective Metal Coatings, famous for over 30 years of reliable, heavy-duty MIM* service, stop rust *better* by their unique penetrating action.

- **DRY IN MINUTES** — quickly penetrate and stop irremovable rust action
- **UNIVERSAL UTILITY** — adhere to metal (or wood), painted or bare, *damp or dry*
- **CHEMICAL RESISTANCE** — withstand acid and alkali fumes, salt spray attack
- **FLEXIBILITY** — remain elastic from 250°F to —40°F

TOTRUST Instant Dry Coatings include rugged METALCOAT, high-gloss ENAMEL and versatile PRIMERS.

***MINIMUM-INTERRUPTION-MAINTENANCE** — the concept of specialized coatings which perform unusual services *quickly*, with minimum shut-down of plant operation. **Write for Bulletin P-57 with full data.**

Advanced Coatings for Industry

THE WILBUR & WILLIAMS CO., INC.

Factory and General Offices, 651 Pleasant St., Norwood, Mass.
In Canada — 7920 16th Ave., Ville St. Michel, Montreal 38, P.Q.

136 **For more facts Circle 470 on Reader Service Card**

FACTORY/EQUIPMENT NEWS

Begins on page 104

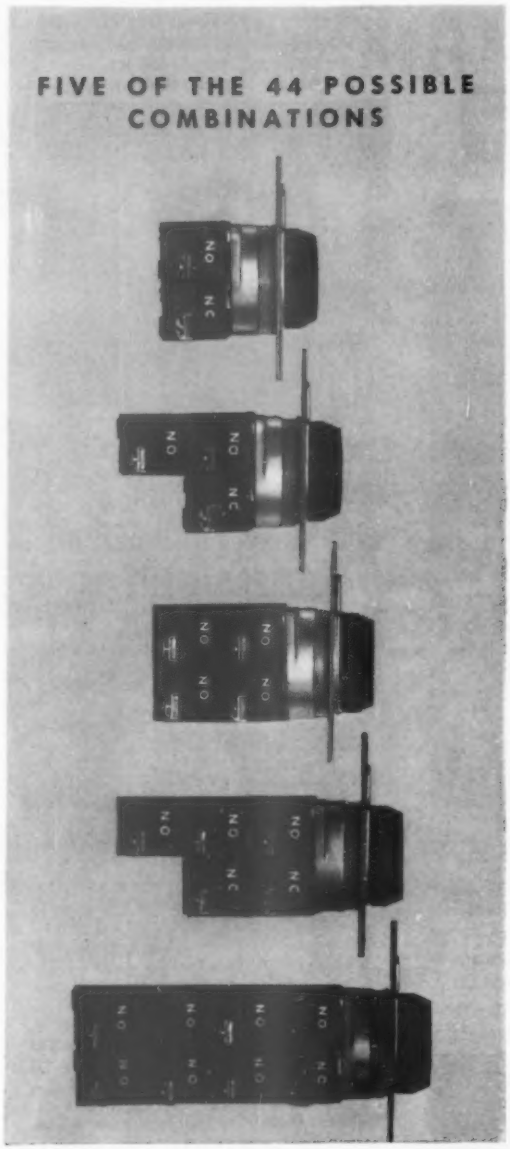
For more about these items, circle item numbers on Reader Service Card next to back cover.

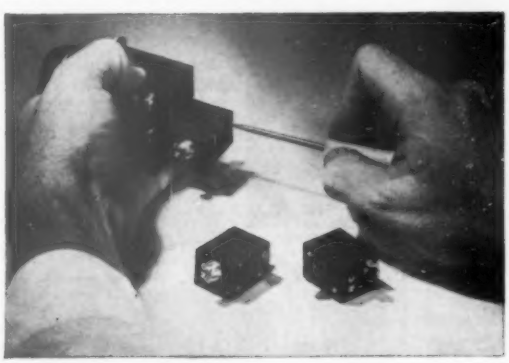
140—Gyro-Drive converts power drills into variable angle tools. Mounts in chuck or on any ⅜-in. threaded-drill spindle. Drills at angles to 52 deg., any direction. Impact tool model also available. Reaches into cramped spaces. *Glenwood Gyro-Drive, Inc.*

141—Thyratron and diode tubes warn of failure 300 hours ahead of time. Color changes from normal blue to neon red before failure to allow for replacement. Cuts downtime. In 2.5 and 6.4 amp. Interchangeable with most tubes. *Reliance Electric & Engineering Co.*

142—ConverTainer system has truck-mounted hoist and steel containers in many sizes that pick up and dump from either end. Expands handling facilities to permit moving or disposing of bulk in 5000 to 25,000 lb. range. Cab-operated hydraulic controls. *Converto Mfg. Co.*

Turn the page

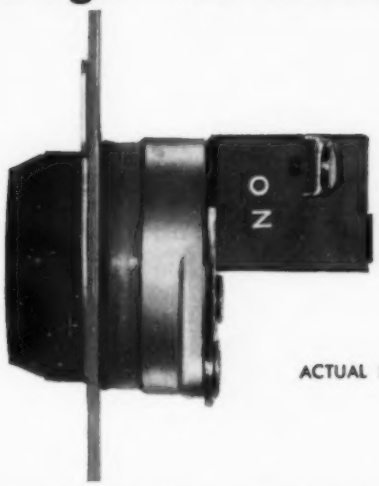




EASY INSTALLATION on a standard operator is possible because blocks are interchangeable. Two captive screws fit into internally threaded screwheads of previous unit to hold block assemblies securely.

NEW

Single-circuit Contact Blocks for General Electric Heavy Duty Oil-tight Push Buttons



ACTUAL SIZE

- **BUY ONLY THE CIRCUITS YOU NEED**
- **CONTROL UP TO 8 CIRCUITS IN ANY COMBINATION OF NO–NC**
- **CONTACT BLOCKS ARE EASY TO MOUNT**

It is no longer necessary to pay for unused circuits in oil-tight push buttons. Now General Electric offers you the savings and flexibility of "single-circuit" contact block design for oil-tight push buttons.

Separate normally open and normally closed blocks are available for mounting with standard G-E oil-tight operators. This means, for example, that if you require two NO and one NC circuits, you can buy this exact combination where formerly you had to use two blocks—each with one NO and one NC contact.

Up to eight blocks may be mounted with a standard operator in *any* combination up to eight NO or eight NC.

Since the new block is offered in addition to General Electric's standard block, and is interchangeable with it, you now have even greater flexibility with the G-E oil-tight pushbutton line.

Specify General Electric heavy duty oil-tight push buttons for your machines or panels, and take full advantage of the savings possible with the new single-circuit contact block. For more information, call your nearby G-E sales engineer or distributor, or write Section 813-37, for Publication GEA-7320. General Electric Co., Schenectady 5, N. Y.

You get **MEASURABLE ADVANTAGES** with **GENERAL ELECTRIC CONTROL**

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ERIEZ Magnetic Minute

60 seconds that will help you improve operating efficiency.

Protect Your MACHINERY, PRODUCTION, and REPUTATION AGAINST DANGEROUS TRAMP IRON

Get positive protection against costly, damaging tramp iron and fine ferrous contamination with Erium® Powered Permanent Plate Magnets. Here are a few of the many reasons why Eriez Magnetic Separators are your best buy:

- GREATEST SELECTION: Choose from 14 magnetic strengths, and many special features for most efficient performance on your particular separating job.
- USE ANYWHERE: In Chutes, spouts, ducts, feed tables and housings, and for suspension over screens, moving conveyors, etc.
- RUGGED CONSTRUCTION: All models have magnetic element permanently sealed against loss of magnetic strength . . . will withstand severest applications.
- FLEXIBLE: Uniform installation dimensions makes all models and strengths interchangeable.

Take advantage of the most versatile line available. Get the model with the Erium® power source that meets your exact needs. Full data in our new bulletin. Write to:

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The goodwill a company enjoys rests, in the final analysis, on the intrinsic quality of its products.

E. C. MILLER
Executive Vice President

ERIEZ

A GROWTH COMPANY . . .
10 NEW PRODUCTS IN THE LAST 5 YEARS

FACTORY/EQUIPMENT NEWS

Begins on page 104

For more about these items, circle item numbers on Reader Service Card next to back cover.

143—Fork-lift truck with automatic drive allows one-lever control of truck direction. Operates in high or low gear with no clutching or shifting. Mast lifts 4000 lb. to 130 in. Independent suspension of rear wheels prevents slipping and provides longer tire life. *Minneapolis-Moline Co.*

144—Temperature indicator detects heat of electronic components within 0.2 F. Electrically insulated glass tip probe is applied to spot for testing. Heat is read directly. Comes with three and four scales, ranges from −154 to +554. Portable. *Atkins Technical Inc.*

145—Wet scrubber, with variable orifice, is effective with wide range of fumes, dust, and odor, despite substantial variation of air or gas flow. Manual or automatic air-volume controls. Capacities: 1000 to 60,000 cfm. Compact, needs little space. *Johnson-March Corp.*

Turn the page

ERIEZ Magnetic Minute

60 seconds that will help you improve operating efficiency.

Let Eriez experience and know how be your MAGNETIC ENGINEERING DEPARTMENT

Eriez offers you a wide choice of magnetic engineering services at your plant . . . services which are the result of our research, field testing, and product development programs.

A wealth of magnetic know-how is available from our full staff of engineers and research and development personnel continually working on new ideas, new designs, new products, new applications.

Eriez devotes a major share of its engineering time to solving customers' problems in 3 major fields:

1. Use of Permanent Magnets to solve problems of separation of tramp iron or fine ferrous contamination.
2. Magnamation® — the principles of permanent magnetism applied to automation, particularly pertaining to ferrous parts, cans, etc.
3. Vibration — both electro-permanent vibratory feeding of all types of bulk materials and in bin vibration.

Whether you're an equipment manufacturer or a direct user, our wealth of technical help is available to you. Write to Chief Engineer:

ERIEZ MANUFACTURING CO.
70RB Magnet Drive, Erie, Pa.

MAGNA-THOUGHT

Engineering field service is one of our prime assets. Eriez men in the field are always ready with the information, help, and counsel you may need.

CHESTER GIERMAK
Sales Manager

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A GROWTH COMPANY . . .
10 NEW PRODUCTS IN THE LAST 5 YEARS

TRAMRAIL CRANES

Indispensable for Efficient Production

Plenty of cranes in this Diesel motor plant ease the work and boost production.

Even though most parts could be moved by hand in this electrical factory, production is speeded and safety improved by employing inexpensive cranes with electric hoists

Three things which are held extremely important to modern industrial plants are achieved by the use of simple Cleveland Tramrail overhead cranes:

(1) Production is speeded
(2) Costs are cut
(3) Safety is improved

Cranes save many costly man-hours of skilled mechanics by enabling one man, in most cases, to pick up and move heavy or awkward parts that ordinarily require hard and dangerous work by several men when lifting and tugging by hand.

Even where light loads are lifted only a few times a week, it has come to be realized that the cost of Cleveland Tramrail cranes is well justified because they are a tremendous factor in the elimination of hernias, smashed hands and feet, wrenched backs and other unnecessary injuries.

Progressive plants regard overhead materials handling equipment as indispensable.

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THE CLEVELAND CRANE & ENGINEERING CO.
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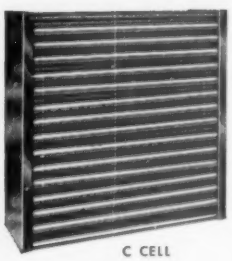
CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

Problems of Air Purification and Odor Control

This is DOREX
... it SOLVES all these



C CELL

H CANISTER

PL GAS ADSORBER

AIR IMPROVER

To most of industry's odor abatement, odor control, and air recovery problems, a Dorex product is the most effective, most economical solution.

By completely adsorbing air-entrained odorous, gaseous, and vaporous impurities, Dorex solves the serious air pollution problems plaguing industry, business, and the general public: purification of severely contaminated intake air; purification of recirculated air; purification of contaminated exhaust air. Thirty years of research, development, and application guarantee it. Write for literature that describes how Dorex products illustrated at the left function in each application below. If yours is a problem not mentioned, describe it to us and we'll provide specific recommendations.

- Purifies intake air before it is admitted to areas that must remain free of foreign odors (food and drink processing, testing, etc.).
- Purges exhaust air of contaminants before it is emitted to outside (animal research labs, etc.).
- Purges compressed air intake of oil vapors and gases.
- Eliminates offensive food odors of cafeterias, other dining areas.
- Eliminates offensive odors of locker and rest rooms.
- Greatly reduces amount of outside air required by air conditioning system.
- Permits recirculation of fume-free air in confined areas (crane cabs of steel plants, e.g.).
- Protects delicate equipment, nearby office personnel from injurious effects of highly corrosive chlorine, sulphur gases (e.g., paper mills, etc.).
- Accomplishes emergency removal of toxic gases (nuclear conditions, etc.).
- Purifies outside air, possibly contaminated by neighboring industry, before it is taken into the air conditioning system.

CONNOR... for Constant Comfort Conditions

Request copies of Bulletin 108A and "Air Conservation Engineering"

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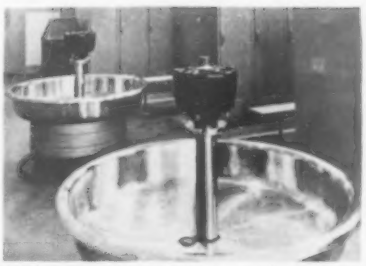
FACTORY / EQUIPMENT NEWS

Begins on page 104

For more about these items, circle item numbers on Reader Service Card next to back cover.



146—Washfountains and group shower fixtures of stainless steel are sanitary, easy-to-clean units. Washbowls, 54 in. in diameter, have foot controls. Round or semi-circular showers provide low-cost installation; save to 80% over comparable units. *Bradley Washfountain Co.*

147—Emergency lighting unit has no manually operated switches or timers. If line power fails, relay is automatically turned on to start emergency unit. Has 2 flood heads; supports up to 5 lights in operation. Visible indicator of battery-charge level. *Electric Cord Co.*

148—Movie projector, for 16 mm. sound film, has forward and reverse gears controlled by one switch for fast, efficient operation. Separate motor and blower for reverse operation minimizes overheating and film damage. Sound shuts off in reverse. *Radio Corp. of America.*

149—Elapsed time indicator records hours, minutes in units of tenths to 99999.9 on easy-to-read counter. Offers high quality and reliability at moderate price. In resettable or non-resettable models. Operates at 120 or 240 v. a-c, 5-watt input. *General Time Corp.*

Turn the page

hoover quality

SELF-ALIGNING PILLOW BLOCK BEARINGS

LIGHT DUTY PILLOW BLOCK BEARINGS

ED Series meets requirements for quality made, economical units to carry light loads at normal speeds.

WITH *hoover-honed* RACEWAYS... *micro-velvet* BALLS

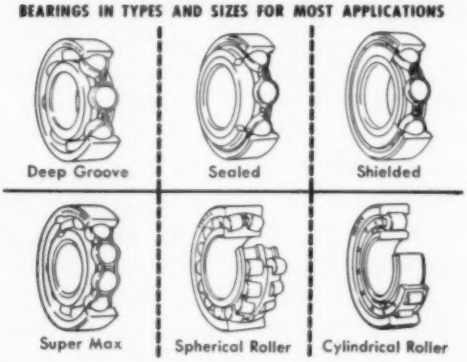
Hoover SP and SPH series pillow block bearings are designed for quick, easy installation. They are automatically self-aligning in any direction. The eccentric collar forms a self-tightening shaft lock. Elongated bolt holes in the base of the pillow block simplify mounting.

Hoover Quality bearing features assure long life and superior performance. *Hoover-Honed* raceways are super smooth, superbly finished. *Micro-Velvet* balls are accurate within millionths of an inch. Felt seals with metal shields retain factory applied lube and protect working surfaces from dirt.

Recommended for normal duty load conditions and shock, Hoover SP and SPH series pillow block bearings are available in shaft sizes from ¾" to 2 15/16".

Hoover-Honed and *Micro-Velvet* are Hoover Trademarks

HOOVER PRODUCES A COMPLETE LINE OF BALL AND ROLLER BEARINGS IN TYPES AND SIZES FOR MOST APPLICATIONS



hoover

BALL AND BEARING COMPANY

5400 South State Road, Ann Arbor, Michigan

Zone Sales Offices and Warehouses: 8581 South Chicago, Chicago 17, Illinois | 290 Ladi Street, Hackensack, New Jersey | 2020 South Figueroa, Los Angeles 7, California

Hoover Ball and Bearing Company F-4
5400 South State Road, Ann Arbor, Michigan

Please send Bulletin 106 which describes Pillow Block Bearings.

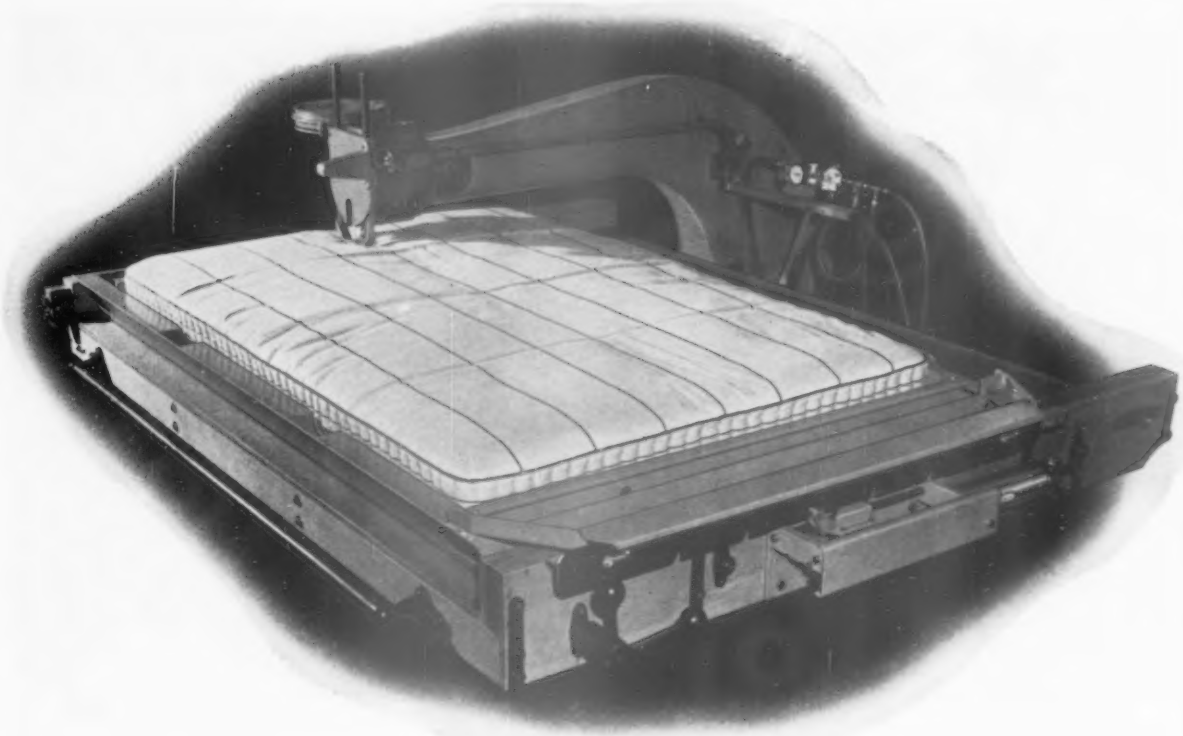
Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____



You sleep better at night with Controlled-Air-Power on the job

Whether you build "mattress tufting machines," like the one illustrated made by Matherson Mattress Machine Co., or make any of the thousands and thousands of different products produced by American industry, there is a place for Bellows-Valvair pneumatic devices—in your plant and in your product.

In your plant, Bellows-Valvair pneumatic devices can turn outmoded equipment into real profit makers; can form the heart of toolroom-built special purpose machines; can cut the costs of scores of operations.

In your product, these ingenious units can simplify design by replacing levers, cams, gears or mechanical linkages, with fast, smooth, air-powered push, pull, lift or turn motions . . . cut design and manufacturing costs, streamline appearance, improve product performance.

No matter what you make, or how you make it, you'll sleep better at night with "Controlled-Air-Power" on the job.

Talk to a Bellows-Valvair Field Engineer.
You'll enjoy it. Phone him—he's in the book.

Bellows-Valvair
AKRON 9, OHIO
DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

1005-C

For more about these items, circle item numbers on Reader Service Card next to back cover.

150—Cable tray, ladder-type, supports long stretches of heavy insulated power cables. Little maintenance—dirt and moisture accumulation is minimal. Ladderway sections (10 ft. long and 3 in. deep) are simply joined with rugged single bolt. *H. K. Porter Co.*

151—Blueprint and tool holder is timesaving accessory for all machine tools, assembly work, inspection. Mounts on machine horizontally, vertically, or at angle. Aluminum stand has clips, adjustable light and chart with gage sizes, etc. Two models. *Kelm Mfg. Co.*

152—Vacuum power sweeper needs little maintenance—only normal engine care. No belts, gears, brushes or chains to service. Picks up everything, including milk cartons and beer cans. Large 7.7-cu-ft. bag, and 30- to 36-in. sweep cleans to 30,000 sq. ft./hr. *Elgee Mfg. Co.*

Turn the page

...When Management Puts The Spotlight on WEIGHING

PRINTWEIGH® RECORDS: a Major Cost Control Tool

Materials become money . . . on your scales. Weight records directly affect costs, quality control, inventories and customer billing. That's why it pays to put the spotlight on weighing . . . and make sure you have the right TOLEDO scale at every weighing point.

A close look at weighing is especially called for if you've made changes in plant layout, materials handling methods, or inventory controls. In any of these areas, scales that don't fit the job can bottleneck operations, infect weight records with costly errors.

Complete Printed Weight Records with TOLEDO PRINTWEIGH "400"

Prints complete weight records on tickets, sheets or strips. Transmits weight data to remote locations where it is recorded by office machines, if desired. Ask for Bulletin 2017.

We'll be glad to help you evaluate weighing efficiency in your operations. A few minutes at each weighing station will put the spotlight on scale capacity and location, dial visibility, platform size and height and other important factors. Send for Bulletin 2036. TOLEDO SCALE, Division of Toledo Scale Corporation, Toledo 12, Ohio.

(Toledo Scale Co. of Canada Ltd., Windsor, Ont.)

SERVICE Factory-Trained 200 Cities

TOLEDO®

Headquarters for Weighing Systems

dust control with 25% savings in fuel bills for Dr. Grabow

A demonstration of WHEELABRATOR'S

VITAL VALUES

A Wheelabrator Dustube cloth tube type Dust Collector ventilates all dust-creating operations at Sparta Pipes, Inc., Sparta, N.C., manufacturer of Dr. Grabow Pre-Smoked Pipes. Replacing an old, open dust bin, the control system not only solved the dust problem, but also cut fuel bills at least 25% through recirculation of heated clean air, and reduced building maintenance costs 15%. The high filtration efficiency of the Wheelabrator Dustube is just one example of the many Vital Values incorporated in all Wheelabrator systems which bring bonus benefits and multiple savings. For your dust and fume control problems investigate Wheelabrator. Write for bulletin 372 D.

Three floors of manufacturing operations are ventilated by a Dustube Dust Collector that has brought 5-way savings to Sparta Pipes, Inc.

VITAL VALUES FOR INDUSTRY

WHEELABRATOR DUST AND FUME CONTROL

WHEELABRATOR CORPORATION, 3/4 S. Byrkit St., Mishawaka, Ind.
In Canada, WHEELABRATOR CORP. of Canada, Ltd. P.O. Box 490, Scarborough, Ont.

FACTORY/EQUIPMENT NEWS

Begins on page 104

For more about these items, circle item numbers on Reader Service Card next to back cover.

153—Portable infra-red burner has two-hour supply of propane gas in replaceable tank. Radiant screen's surface heat varies from 1200 to 1800 F., output 10,000 Btu./hr. Operates in any position. Ideal for experimental drying or heating. *Bryant Industrial Products Corp.*

154—Electronic switch, in tape form, turns anything on or off by contact (finger or liquid, for instance) between two wires. Consists of easy-to-install plug-in control box ($58) and tape. Handles 600-watts resistive, ⅓-hp. inductive load. *Gardiner Electronics Co.*

155—Flow meter and filter automatically lights up when clogging causes liquid flow to fall below preset volume. Can be set to turn off power until filter is cleaned or replaced. Saves time, protects expensive machinery from damage. *Capital Engineering & Mfg. Co.*

Turn to page 149

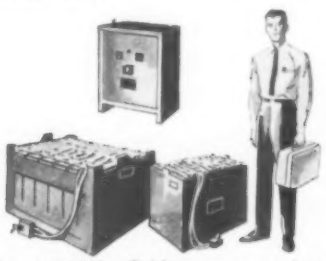
EXIDE POWER PACKAGE

Exide Industrial Marketing Division, The Electric Storage Battery Company, Philadelphia 20, Pa. (ESB)

A well-matched pair. Operator connects Exide truck battery to Exide ETR rectifier type charger, especially selected to charge the battery fully within the allotted time.

WHY A BATTERY AND CHARGER SHOULD BE MATCHED

The big reason is economy. In electric truck service, a fully charged battery means your truck can do more work. So you get more done for each dollar of cost. Furthermore, if you don't charge your battery fully each time, you could be shortening its life. And that would add to your cost too. For maximum economy, it is important that your charger have adequate capacity to charge your battery fully, safely and within the allotted time.



The complete Exide power package. Three basic battery types, four charger types, both in complete range of capacities, plus Exide service—all from one dependable source.

Make sure, however, that your charger is not oversized. You only need enough charger capacity to do the job. Any more is wasted. Excess capacity simply represents an overexpenditure of money for your electric power.

Obviously, specifying the battery and charger you need for your own power requirements is an engineering problem. And Exide men approach it on an engineering basis. The objective is to give you the right power package for maximum economy.

The first step in economy is to select the right type and size battery for your truck. This can best be done from a broad battery line. And Exide offers the broadest line of industrial truck batteries on the market, including Exide-Ironclad with tubular positive plate construction; Exide-Powerclad premium flat plate; and the improved Exide nickel-iron-alkaline (invented by Thomas A. Edison). There's a type and size for every truck application.

Second, your Exide man recommends the correct type and size of charger for your particular battery, based upon your plant conditions. Here he can choose from the four basic industrial truck battery charger types in the Exide line: the vertical motor generator type which saves floor space and initial cost; the new ETR rectifier with low maintenance requirements and longer life; the type PMR rectifier for economy and convenience; and the horizontal motor generator with a long record of dependability, safety and life.

For both batteries and chargers, Exide offers complete service to insure that you get maximum battery and charger life.

Only Exide offers this complete power package—your key to the lowest-cost electric truck power you could buy. Write for complete details. Exide Industrial Marketing Division, The Electric Storage Battery Company, Philadelphia 20, Pa.

Exide®

RUST-OLEUM

NEW COLOR

HORIZONS System

STOPS RUST AND PROVIDES LASTING BEAUTY

Gone are the days when color was used for the sake of color alone. Today, color is functional—helping to improve morale and increase efficiency—serving to color-code and mark safety areas, etc. The Rust-Oleum New Color Horizons System goes even further. It combines four important factors (1) the ability to stop rust, (2) smart, modern color harmony, (3) the durability to last and last, (4) ease of application that saves time, money, and metal. See how this system can bring lasting beauty to your plant, machinery, equipment, tanks, fences, etc. Your Rust-Oleum Industrial Distributor, with your Rust-Oleum Factory Specialist, will be happy to survey your plant and provide complete recommendations. Prompt delivery is assured from Industrial Distributor stocks in all principal cities of the U.S., Canada, and many countries around the world.

Faced with coating problems like these? Heat resistance, water resistance, chemical resistance, floors, galvanized metal, coatings that will dry in less than thirty minutes? Rust-Oleum, in its various systems, can be your answer. Call your Rust-Oleum Industrial Distributor, or write for the facts.

Apply Rust-Oleum 769 Damp-Proof Red Primer directly over sound, rusted surfaces to STOP RUST and cut maintenance costs

Just scrape and wirebrush to remove rust scale and loose rust—then brush Rust-Oleum 769 Damp-Proof Red Primer right over the remaining rust. Its **specially-processed** fish oil vehicle penetrates rust to bare metal as proved in radioactive tracing studies. You save time and money, as costly surface preparations are usually reduced.

RUST-OLEUM®

See our catalog in Sweet's.

STOPS RUST!®

Distinctive as your own fingerprint.
There are imitations,
but only **one** Rust-Oleum.
Accept no substitute.

PROVED THROUGHOUT INDUSTRY FOR OVER THIRTY-FIVE YEARS

You take the brush! Try a free test sample!

ATTACH TO YOUR LETTERHEAD

RUST-OLEUM CORPORATION
2984 Oakton Street • Evanston, Illinois

At no cost or obligation, please send me:

- ☐ New full-color catalog on New Color Horizons System and specialized Rust-Oleum systems. Including color charts and applications.
- ☐ FREE TEST SAMPLE of Rust-Oleum 769 Damp-Proof Red Primer.
- ☐ Please have your representative contact us to discuss a plant survey.

HYSTER

Hyster 2,000 and 2,500 lb. cushion tire lift trucks—industry's newest and finest.

WRITE YOUR OWN TICKET

"American Industry" is a phrase which really means a lot of companies, each with individual requirements for working capital and equipment. This great variety is the reason Hyster's Custom Leasing Plan was created. Now you can virtually write your own ticket for both equipment and financing to meet your material handling needs.

This plan puts the newest and finest lift trucks to work for you on your own terms. You can rent, lease or buy... one truck or a fleet... by the day, week, or month... for one day or five years. You can do your own maintenance or choose a plan that includes it. You can select any combination of rentals, with or without option to buy.

Financing is equally flexible, and the choices are offered in your own area by your Hyster dealer, who will be pleased to work with you to survey your needs for trucks and attachments. Talk with him soon about Custom Leasing... the plan that makes it easier than ever for you to use the equipment that sets the engineering pace for all lift trucks.

INDUSTRIAL TRUCK DIVISION—Lift trucks, mobile cranes, straddle carriers
TRACTOR EQUIPMENT DIVISION—Construction and logging equipment
MARTIN TRAILER DIVISION—Heavy machinery hauling trailers
INTERNATIONAL DIVISION—Overseas manufacturing, sales and service
Manufactured in: Portland, Oregon (Home Office) • Danville, Ill. • Peoria, Ill. • Kewanee, Ill.
Australia • Brazil • England • France • The Netherlands • Scotland • Union of South Africa

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HYSTER CUSTOM LEASING PLAN

HYSTER COMPANY
HYSTER LEASING DIVISION
P. O. Box 4318 • Portland 8, Oregon

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FACTORY/EQUIPMENT NEWS

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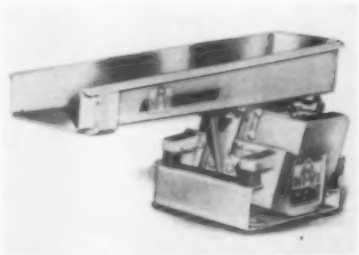


156—Vibratory feeder moves lightweight or bulky materials at high speeds to 60 fpm. Feed rate, spreading, agitating or heating can be precisely controlled. Specially designed high damping spring system prevents overruns and spillovers. A-c operated. *Eriez Mfg. Co.*

157—Rotary switch is for motor control to 16 hp. at 600 v., and for instrumentation or control circuits. Its 20-amp. modules, when combined, control to 96 contacts through 18 rotary positions. Resists humidity, fungus. Guaranteed 5 million operations. *American Solenoid Co.*

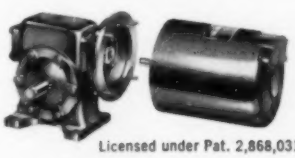
158—Compressor, gas - engine driven, comes in 5-, 6-, 8-, and 10-cyl. models rated at 1500, 1800, 2400, 3000 bhp. For use in variable speed, variable load applications. Has precision aluminum-type main and connecting rod bearings, 5-micron oil filter. *Clark Bros. Co.*

Turn the page

PERFECTION
Flanged & Motorized Worm Gear
SPEED REDUCERS

Perfection Motorized Worm Gear Speed Reducers are available in 956 different combinations, with ratios ranging from 5 to 1 to 60 to 1, and in capacities from 1/6 H.P. to 5 H.P. This line of complete Motorized Reducers is available from stock for immediate delivery. Perfection "C" flange Reducers may be ordered complete with motor or without motor, to be used with a motor of your own choice.

Flanged motor reducers offer the maximum in compactness, rigidity and adaptability. Through the use of standard NEMA face mounted motors, complete interchangeability between motors is provided. Motor maintenance is possible without disturbing the drive and reducer. Motor assembly is fast and positive with no alignment problems.



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Write for your free copy of our new 28 page catalog containing illustrations, charts and tables to help you choose the right Reducer for your particular application. Ask for Bulletin No. M-140.

AMERICAN STOCK GEAR DIVISION

PERFECTION GEAR COMPANY **HARVEY, ILLINOIS**

For more facts Circle 483 on Reader Service Card

Here's How To Handle FLAMMABLE SOLVENTS With Production-Line Efficiency and Maximum Safety...

SWABBING & SMALL PARTS CLEANING

Plunger Can

For quick, one-hand moistening of swab, brush or cloth. Depressing spring loaded dasher pumps measured quantity of fluid into cup. Release and excess drains back into can. 5 sizes—dashers 1 to 7" dia. FM approval*.

Bench Parts Washer

Keeps workers hands out of solvent. Removable parts basket has handle. Depress spring mounted fire baffle dasher for solvent, release to drain. Without basket, large cloths or swabs may be saturated. 3 pint capacity. Basket and dasher—5⅝" dia. FM approval*.

WASHING & CLEANING OPERATIONS

Wash Tank

Two handled perforated basket for fast, easy parts agitation. Self-draining by resting basket on lugs at top of tank. Renewable fusible link melts at 160° F, automatically drops cover to snuff out fire. 4 sizes ranging from 8½"x 8½"x9¾" to 15"x15"x 15". FM approval*.

Machine Bench Can

Attaches to bench alongside of machine. Operator cleans and rinses parts by depressing fire protective metal dasher. Size 10" x 7" x 8". FM approval*.

Foot Treadle Dip Tank

Work-high dip tank with self-closing cover operated by foot treadle. Designed for washing large parts. Safety air check cushions accidental fall of cover. 24¾" long x 13" wide and 8¾" deep. FM approval*.

Air-Matic Parts Washer

Air Motor moves basket thru solvent, automatically cleans parts while machine operator continues production. Fusible link drops cover automatically to snuff out fire. Operates on 25-50 p.s.i. air. Size 15"x15" x21". FM approval*.

Swab Can with Reservoir

For applications where large quantities of solvent are required. Supply tank mounted on common base with applicator can. Valve permits operator to replenish liquid supply at bench. Perforated metal fire baffle dasher. 2 sizes—1 gal. and 5 gal. capacity. FM approval*.

LOOKING FOR MONEY-SAVING IDEAS?

Protectoseal Catalog has many time and labor-saving suggestions for handling flammable solvents in production applications. Sent without obligation.

**Factory Mutual Laboratory approval*

THE PROTECTOSEAL COMPANY
1962 South Western Avenue Chicago 8, Illinois

FACTORY/EQUIPMENT NEWS

Begins on page 104

For more about these items, circle item numbers on Reader Service Card next to back cover.

159—Hand truck, for warehousing, order picking and distributing, has forks that lift to 3¾ in. Can be used as pallet or drag-line truck. Capacity: 2000 lb. Tow pin is in 360 deg. floating swivel assembly. Demountable rubber-tired wheels. *Nutting Truck & Caster Co.*

160—Rapid start ballasts are for use in fluorescent fixtures with restricted heat dissipation. Case and coil temperature is from 15 to 20 C. under maximum limits. Result is long, trouble-free ballast life. In 430-, 800-, 1000-, and 1500-ma. units. *Universal Mfg. Corp.*

161—Engraving tool, with carbide point, writes names or code numbers on tools, machinery, and parts at 7200 vibrations/min. Electric "pencil" has adjustable control for fine, medium, coarse stroke. Writes on marble, tile, glass, plastic. *Burgess Vibrocrafters, Inc.*

Turn the page

Now! The LUNKENHEIMER BALL VALVE

Fig. 700-T
¼" to 2", Screw Ends, Bronze Body, Teflon Seats and Seals.

Fig. 700-B
¼" to 2", Screw Ends, Bronze Body, Buna-N Seats and Seals.

AVAILABLE SOON in OTHER MATERIALS

New Top-Entry Design

Engineered with traditional Lunkenheimer quality . . . self-aligning ball seals against both seats . . . long-lasting resilient seats for tight shut-off . . . straight-through flow . . . quarter-turn operation . . . top entry for easy maintenance

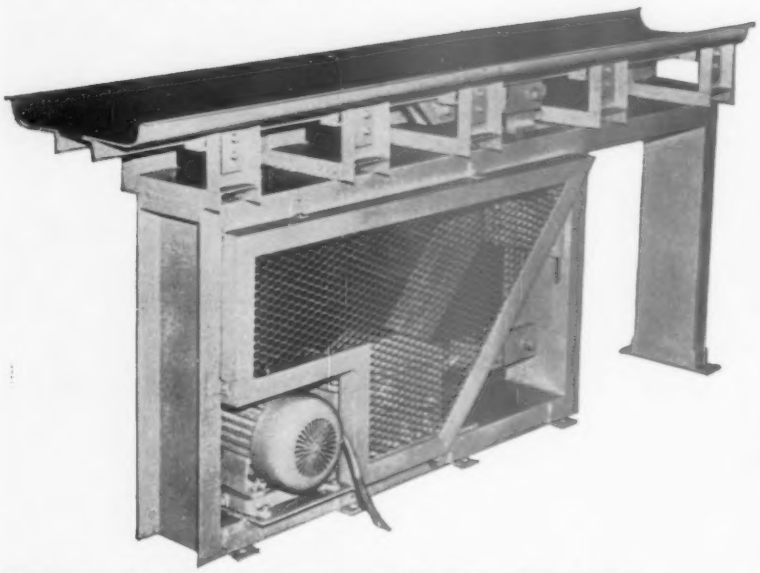
Order from your Distributor

or write The Lunkenheimer Company, Cincinnati 14, Ohio

L-960-3

LUNKENHEIMER®
THE ONE *Great* NAME IN VALVES
• BRONZE • IRON • STEEL • PVC

IF YOU ARE THINKING ABOUT O-S-C-I-L-L-A-T-I-N-G CONVEYERS



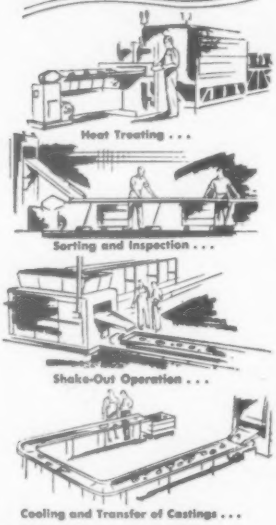
WE'D LIKE TO TELL YOU ABOUT LIVE-FLO

AN AMAZING NEW SYSTEM OF HANDLING MATERIALS

LIVE-FLO units are oscillating conveyers of extremely simple design. They will negotiate turns and moderate grades, are unbelievably quiet in operation, and convey small parts smoothly and under complete control.

LIVE-FLO can be applied anywhere in your plant where materials must be conveyed in a continuous flow at slow, evenly controlled speeds. It will provide an amazingly smooth, low-cost conveying system.

Write today for Bulletin # LF 60.



MATHEWS CONVEYER COMPANY

GENERAL OFFICES . . . . . ELLWOOD CITY, PENNSYLVANIA
PACIFIC COAST DIV. . . . MATHEWS CONVEYER COMPANY WEST COAST, SAN CARLOS, CALIFORNIA
CANADIAN DIVISION . MATHEWS CONVEYER COMPANY, LTD., PORT HOPE, ONTARIO.

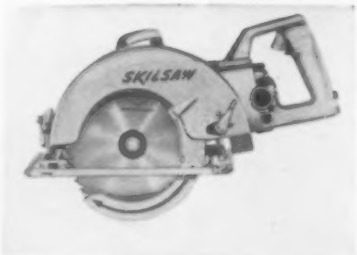
MATHEWS

Over Fifty Years of Leadership in Mechanized Handling

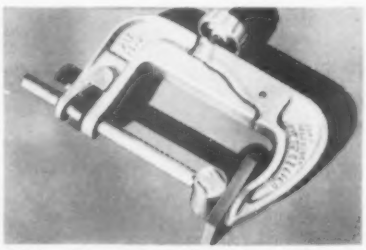
FACTORY / EQUIPMENT NEWS

Begins on page 104

For more about these items, circle item numbers on Reader Service Card next to back cover.



162—Portable power saws use worm gear principle to deliver high-speed cutting without motor burn-out even under excessive and frequent overloads. Automatic oil-level control prevents overfilling. Pushbutton release-lock for changing 6½-, 7¼-, 8¼-in. blades. *Skil Corp.*



163—Threadless clamp, with fingertip control, keeps frame from twisting when being tightened. Anvil and spindle do not turn while pressure is being applied—no clamp marks. Quick closing, opening. Anvil or vee spindles; in 2, 4, and 6 in. sizes. *United Associates.*

164—Portable hand tool lifts, pulls, and stretches to 2000 lb. Needs only 30-lb. pull on lever to lift maximum load. Compact, lightweight Tuffy operates in any position. Lifts continuously, locks instantly for carrying. Indoor, outdoor use. *Bel-Tran Equipment Co.*

PLAIN GROUT SHRINKS . . . leaves only a web of mortar and a small shim area to support the equipment baseplate. Result is a *short-life* grout that causes shutdowns . . . possible equipment damage . . . and expensive re-grouting.

EMBECO GROUT IS NON-SHRINK . . . readily and solidly fills the space to be grouted and permanently retains its original volume. Provides full, even baseplate support . . . helps assure proper equipment positioning and alignment. EMBECO means dependable, *long-life* grout.

Today's figures show that *machinery* for the average U. S. factory costs $4,680,000[1] — a sizeable, important investment geared toward smooth, efficient production. But the *grout* under this valuable equipment *costs only pennies* by comparison.

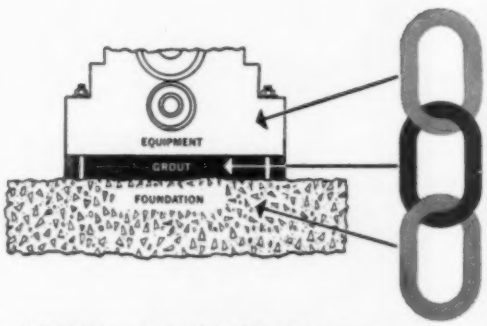
Compare the grouts pictured above. It's clear evidence that EMBECO can save *you* costly re-grouting and production downtime.

Here's why EMBECO means a superior grouting job every time—

- **Non-Shrink** . . . assures tight, level, permanent contact with equipment baseplate.
- **Flowable** . . . quickly, completely fills the space, increases ease of placeability.
- **Strong and Tough** . . . withstands impact, pounding action, vibration, side thrust and torque . . . maintains perfect alignment.

Before *you* grout another piece of heavy equipment—call in the local Master Builders field man for full information, or write to us for details on how EMBECO can help you *grout for good.*

[1]*U.S. average*—initial *machinery and equipment costs for* new *factories.*



★**GROUT** . . . is the "vital link" between equipment and foundation.

The Master Builders Company • Cleveland, Ohio
Division of American-Marietta Company
World-wide manufacturing and service facilities

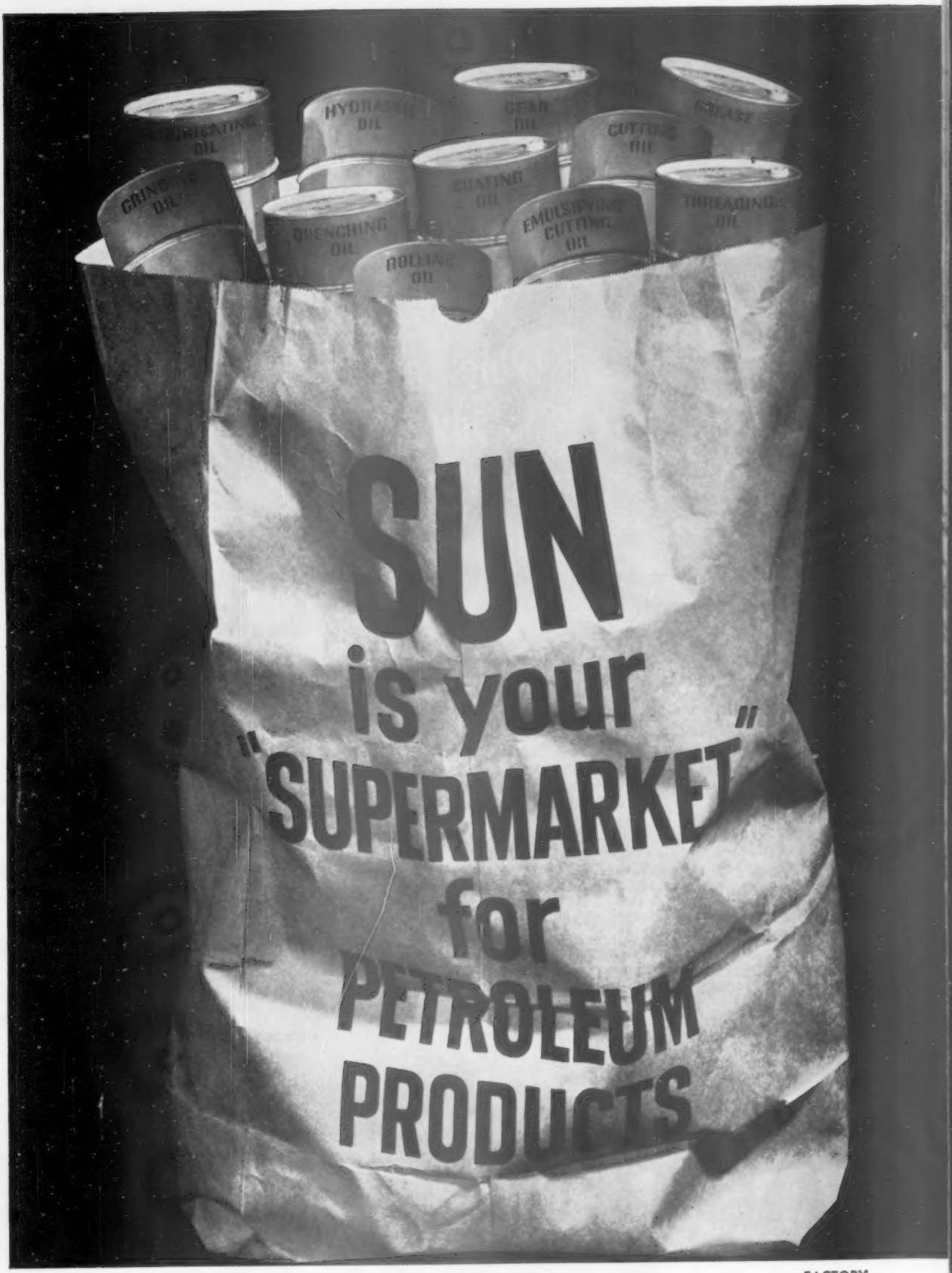
Our 50th Year

MASTER BUILDERS EMBECO*

*EMBECO *is a registered trademark of The Master Builders Co. for its specially-prepared, flowable, non-shrink grouting products.*

E-30

For more facts Circle 487 on Reader Service Card


HYDRAULIC OIL
GEAR OIL
GREASE
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GRINDING OIL
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FACTORY

IDEAS OF THE MONTH

By LEWIS K. URQUHART, Consulting Editor, FACTORY

(For more information, circle item numbers on Reader Service Card next to back cover)

Good news for anyone stuck with obsolete machine tools: New trade-in plan *(Pratt & Whitney)* means you can turn in used or surplus machine tools of any manufacturing origin as credit or part payment for purchases of 1961 Pratt & Whitneys. Need further incentive to modernize? **(236)**

AIM stands for assignments in management. Monthly AIM letters *(AIMCO)* are penned by old pros who stress practicalities, not theories. Here's a supervisory training service that has caught on fast. And get this: You don't have to buy letters in bulk. One sub entitles you to reproduce (without credit) all or part of each monthly letter and distribute as you please. **(237)**

Boiler log kits, one for low-pressure heating, one for high-pressure power boilers, both free, assure regular operating and maintenance checks, are insurance company's *(Hartford)* gift to accident prevention. **(238)**

One Way to Make Your Job a Little Easier *(LaSalle Steel)* is picture story of all-purpose steel bar that's ideal for making your own repair and maintenance parts. Reading time: 6 min. **(239)**

Swift Floor is plastic material *(Monroe)* with Cryptolite. Guaranteed to take 50,000-lb. loads. Traffic rolls 60 sec. after application. **(240)**

Booklet of the Month is "Vehicular Mechanical Arms Systems" *(General Mills)* which discusses manned and unmanned systems, plus suggested vehicles and uses in hostile environments—explosive, radioactive, toxic. **(241)**

Train janitors! Well, why not? "Sanitation Tests for Custodians" *(Puritan Chemical)* shows how better methods enable housekeeping forces to keep house better, quicker, with less fatigue—and at lower cost. **(242)**

Keeping your head above the vast flow of current technical literature is some job these days. But one of many musts. One way we recommend is to subscribe to *Engineering Index*, whose staff last year reviewed every issue of more than 1900 publications, selected and annotated some 34,000 articles covering 249 "field of interest" divisions of engineering. **(243)**

To protect valuable shipments, automatic freight monitor *(Lockheed)* delivers second-by-second report on such physical phenomena as impact, acceleration, temperature, pressure, etc. **(244)**

For better unit heating: Unit heater troubles can be quickly spotted by referring to wall chart *(Modine)* with checklist that shows what may be causing inadequate performance in 10 different situations. **(245)**

Turn the page

J & L NEWSLETTER—

the man who needs a new machine tool is already paying for it

Actual memo from Production Control to Plant Manager in a large metalworking plant.

RE: NUMERICAL POSITIONING DRILLS

This memorandum is issued to call to your attention that not having a 2nd J & L Positioning Drill in Department 24 is costing us money. We are either sending overloads to the other divisions or running them on slower machines.

Last week, due to overloads on the Positioning Drill, it was necessary to run some rush work on another machine tool. Each order cost us extra time allowances. Two of the worst jobs were as follows:

1. Part #12036, Operation #2. - We had to give additional time of 1.80 minutes per piece. This is a 56% increase per piece and cost 5.3 extra hours for the entire lot.

2. Part #12461, Operation #2. - We had to give additional time of 2.00 minutes per piece. This is a 40% increase per piece and cost 2.5 extra hours for the entire lot.

I would also like to remind you that we have quoted on several rush subcontract jobs to be run on this machine. If overloads or a breakdown should occur, we would incur substantial losses from running them on slower machines. For example, on subcontract job #XX-2912, we had 30 pieces to run on the Positioning Drill. The cycle time is 23.00 minutes. Because of the Positioning Drill overloads when we quoted on the job, we also computed the time to run on a radial drill. The cycle time came out the same but we would have to spend $250 for the jig. As the jig cost was so much for a small lot, we also computed the cost on a Post Drill. Here our cost increased 23% per piece because of the additional cycle time and also because the labor grade was one higher.

There is also the possibility of incurring substantial increase in cost if this one machine is down or becomes overloaded because of having to run production orders on jig borers and boring machines. This is caused by lack of jigs on many new parts. As you know, we do not have to "jig up" like we used to because of having the Positioning Drill. For example:

1. #75513, Main Valve Bodies: Routed to the Positioning Drill and we saved about $650 in jigs.

2. #60342, Adapter: We saved about $450 in jigs.

3. #75589, Lead Screw Bracket: Routed to Positioning Drill and we saved about $350 in jigs.

4. #700,090, Mounting Plate for Control Unit: We saved about $250 in jigs.

Please let me know if there is anything I can do to expedite getting a second machine fast.

There's nothing we could add to this "voice of experience" — except, maybe, to tell you more about our positioning table. *Write for further details.*

JONES & LAMSON MACHINE COMPANY
505 Clinton Street, Springfield, Vermont.

For motion-economized assembly, never underestimate usefulness of Plastibox containers and accessories *(Lewis)*. New booklet gives full directions for setting up straight, rotary, circular, semi-circular bench assemblies, as well as floor stands, and mobile truck assembly. **(246)**

Too much tension? It's TEO for you—and a few push-ups. TEO stands for tension-easer office *(Executive Furniture Guild)*, actually just a cubicle with exercise bike, chinning bar, push-up platform. Says co-designer and physical fitness consultant Bonnie Prudden: It's a built-in gym where the harried boss (you) can go to "let off steam." **(247)**

Easy up, easy down. For one man, that is. Which explains your maintenance department's preference for scaffolds *(Swing-Lo)* that are adjustable to upright beams from 4 to 8 in.—and for elevations up to 20 ft. **(248)**

Floor surfacing blues are quickly driven away by Penntrowel Latex *(Pennsalt Chemicals)*. It's Portland cement and latex mixture that provides unusually resilient surface. Easy to apply. No special preparation needed. Readily feathered. Self-curing. Topping can be as thin as ¼ in. **(249)**

Mercury lamps, all you need to know about same. In new booklet *(Westinghouse)*, latest information on lumen output, life ratings, etc. **(250)**

Vibration-damping tape *(3M)* consists of polyurethane foam, vinyl backing, high-tack adhesive. Designed for easy application on thin sheet metal, conforms readily even to rough and irregular surfaces. In 6-in. width and in lengths up to 8 ft. And it's moisture- and flame-resistant. **(251)**

Lucky the draftsman whose drawing board is surfaced with pastel green vinyl *(Keuffel & Esser)*. Backed with adhesive, it stays flat, won't creep, wrinkle, stretch. Even if he bears down hard, pencil lines, grooves, or small compass holes tend to disappear in short time. **(252)**

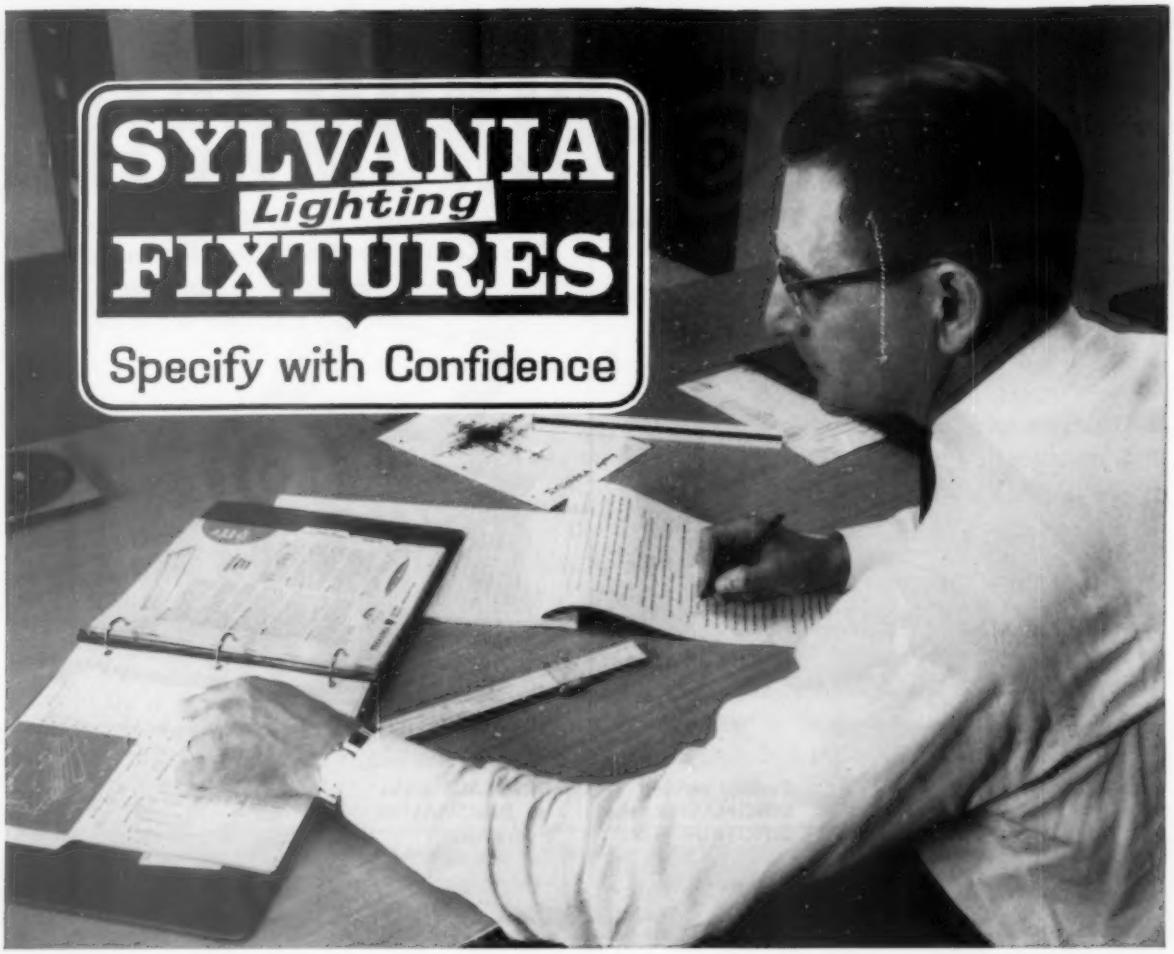
Spray-painting schools *(DeVilbiss)* last a week, turn out experts. Free tuition, but you pay travel and living expenses. **(253)**

Any maintenance man would give his bottom dollar for one of those slick mobile benches *(Roll-On)* with all those drawers (18) and small-parts pockets (48). No more running back to tool crib for "more." **(254)**

Music-in-the-plant converts mustn't make a move without hearing full story of new low-cost background music system *(Musi-Pak)*. **(255)**

In-Sight-Trol (short for instant sight control) is new visual-graphic schedule board *(Game-time)* with aluminum tracks into which coded cards can be snapped. In widths from 37 in. (25 columns) to 60 in. (42 columns), and in heights from 14½ in. (5 columns) to 55½ in. (60 columns). **(256)**

Turn the page



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Painting again? Who isn't? Better be sure your maintenance department has one of those slide-chart painting guides *(Barreled Sunlight)* to 57 varieties of exterior and interior finishes, as well as recommended primers. Guide also gives drying time and coverage in sq.ft. per gal. **(257)**

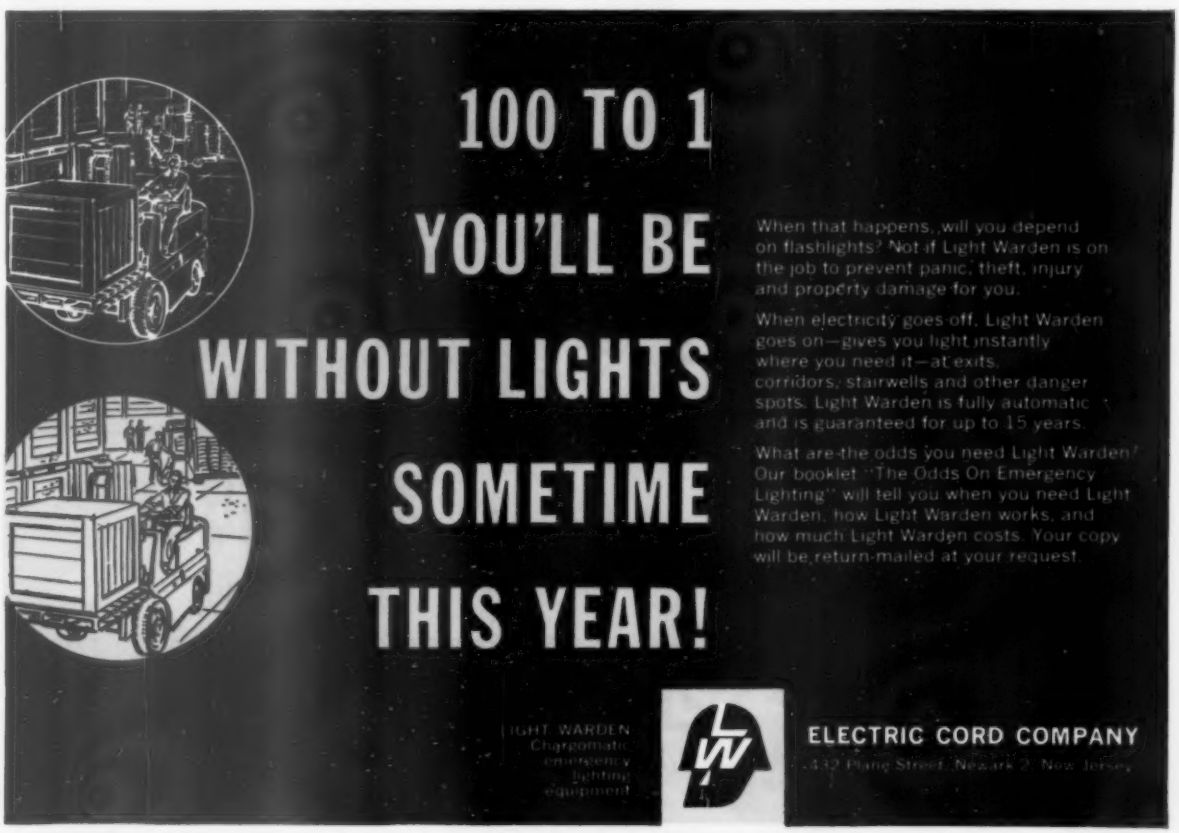
Handy-dandy spray can *(Burgess Vibrocrafters)* is refillable, electric, what old doc ordered for low-cost applications of lubricants, disinfectants, rust inhibitors, sealers, coatings, insecticides, coolants, etc. **(258)**

Make your own dry ice for shop or lab use. Jet adapter *(Rolf Darbo)* converts CO_2 fire extinguisher to produce fine controllable stream. **(259)**

Combination ladder *(Dayton)* is stepladder for normal overhead work, goes straight and doubles your reach for higher-up jobs. Just disengage spreader bar and fold back-standard upward. In 6-, 7-, 8-ft. lengths. **(260)**

Secret of explosion-proof electric receptacle and plug *(Hubbell)* for use in Class 1, Group C & D explosive atmospheres: Self-hardening epoxy resin is poured into shell when cord is fastened to terminals; current can't flow unless plug has been dextro-rotated 22 to 25 deg. **(261)**

Turn the page


100 TO 1
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When that happens, will you depend on flashlights? Not if Light Warden is on the job to prevent panic, theft, injury and property damage for you.
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Now you can mount junction boxes on concrete, cinder block, tile, metal surfaces without drilling holes, without plugs, without mess—and in half the time it used to take. Secret is epoxy adhesive *(Permacel)*. One cup's enough to mount 8 to 10 4x4-in. boxes. **(262)**

Stop paper towel wastage? Sure. By installing dispensers *(Crown-Zellerbach)* with spring-loaded flap. User has to hold flap down with one hand, pull towel with other, can't grab two or more in one fell swoop. **(263)**

Nine fire schools *(Ansul)*, each lasting three days, are scheduled from May 22 to Sept. 18. Actual firefighting each and every day. **(264)**

Lateral filing may be cure for ye olde filing headache. Unit Spacefinder *(Tab Products)*, for instance. Its basic elements are free-standing metal frame and fiberboard boxes, 4 in. wide, that slide freely on rails. **(265)**

Autobrewmatic is (you guessed it) newest (up to presstime) coffee brewer *(Western Urn)*. No bags, baskets to clean or replace. Load with 5 lb. of coffee, push button. Presto! fresh pot of Java in 3 min. flat. Machine measures coffee, adds water, brews, flushes for next cycle. **(266)**

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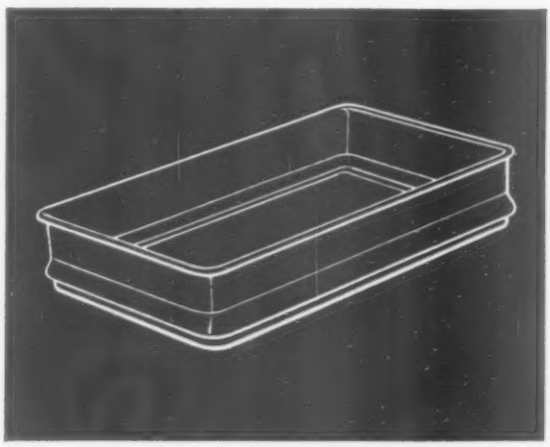

Let wear-ever
keep it handy

Small parts can be expensive. That's why Wear-Ever's rectangular pans and transport boxes are all drawn seamless from one sheet of extra-tough, dent-resistant aluminum alloy. No seams to catch tiny parts or dirt. Easy-to-clean rounded corners, sanitary open bead. Send reply card for full details; or write Wear-Ever Aluminum, Inc., New Kensington, Pa. Count on immediate shipment from stock

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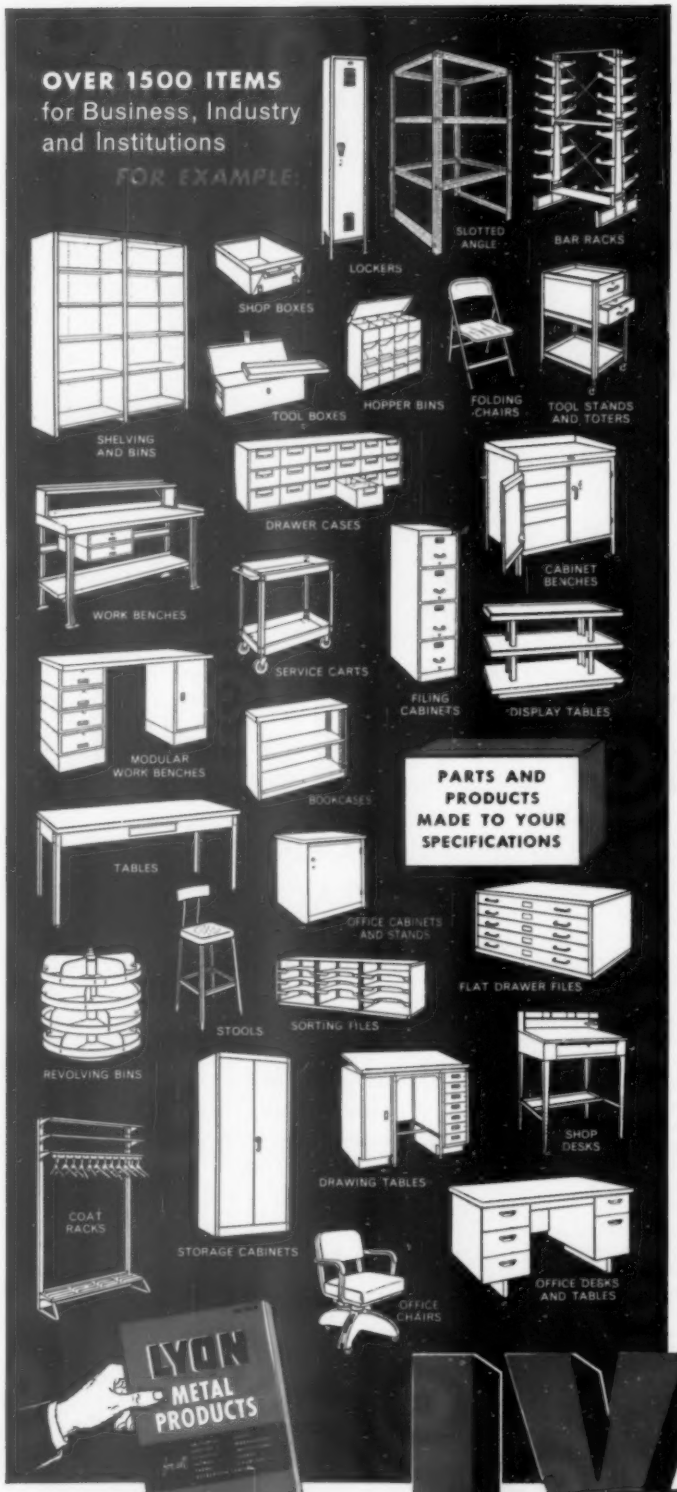

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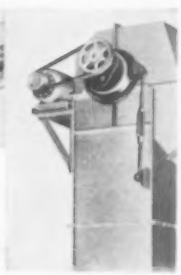
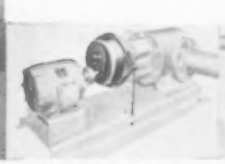


bucket elevators, freight elevators, skip hoists, car pullers, cranes and hoists

rotary screens, tumblers, mixers, washers, dryers, cookers . . .



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run-out rolls, live rolls, line shafts

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FACTORY
PLANT OPERATIONS
CASE BOOK

ENGINEERED PLANT SAVINGS

Numerical control slashes costs

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Miserly meters

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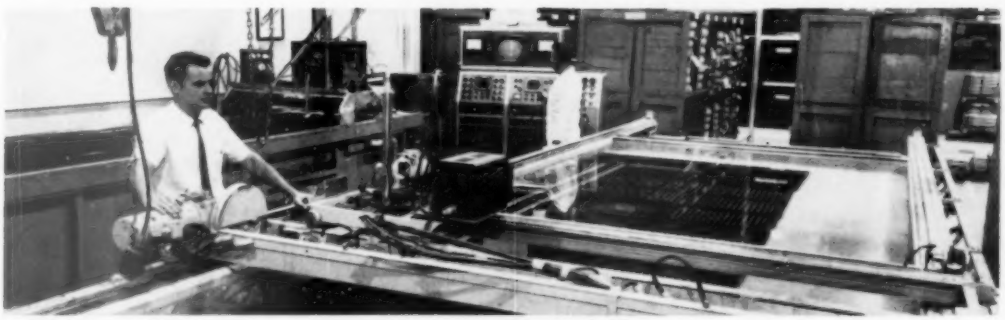

Ultrasonic testing catches flaws

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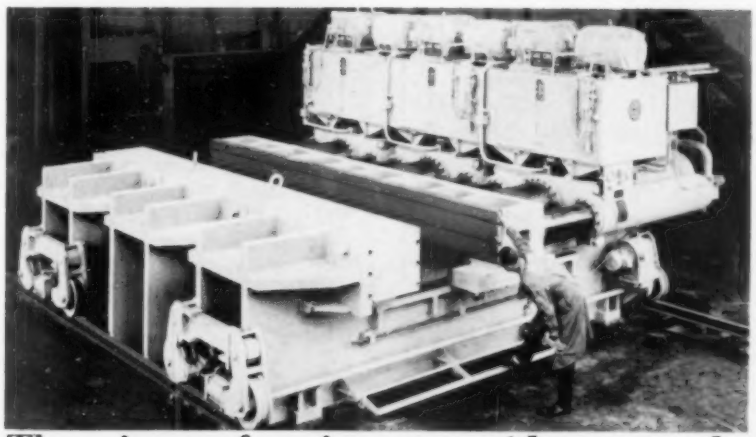

Three-in-one forming press rides on tracks

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Testing by sound underwater

An ultrasonic inspection system is pinpointing defective parts at Convair (Fort Worth, Tex.), division of General Dynamics Corporation. The parts are immersed in a 14,000-gal. pool (32x12x5½ feet) for the inspection test.

A scanning head (Curtiss-Wright Corporation, Princeton, N. J.) can trace either flat parts or a 60-deg. contour within a 20-in. radius. It's 8 inches in diameter, swivels in any direction. Four sets of tiny combination electric lights and photoelectric cells surround it.

The scanner can move over the test part at 36 inches a second. And there's no chance of its going past the edge of the part. When the photoelectric light reaches the edge, the scanner automatically shifts and reverses its field.

As the electric light illuminates the part surface, the photoelectric cell picks up the reflection and senses the surface. A cathode ray picture of the part is produced from data sent through the scanner's transducer to the recorder. This enables the operator to detect voids in adhesives or bonding. The transducer is a thin crystal with piezo-electric qualities.

Sound frequencies between 2-million and 25-million cycles per second are used in the test. Since ultrasonic sound will not travel through air, the transducer crystal has to be coupled to the test piece by a liquid such as oil or water.

In one operation, testing time for a part was cut from an hour and a half to two minutes, 45 seconds.

Five-buck saw tears bags open

Opening tough paper bags is a split-second job at Zep Manufacturing Corporation, Atlanta, Ga. A $5 saw blade does the trick.

The large-toothed blade, intended for a logger's saw, is mounted over the mouth of a hopper which gravity feeds to a blender below. The dry chemical compounds come in heavy paper containers that would ordinarily require at least a pause to cut open with a knife.

The worker drops the bag on the saw blade, lets the contents run out, gives the bag a final shake, and is ready for the next one.

Taking pressure off top executives

Are the pressures of your job getting you down? Art Metal, Inc., New York, suggests following this 14-item checklist to avoid the physical and mental strain that can eventually lead to heart attacks—and to increase the efficiency of your work at the same time:

1. Plan more stopping places. They'll relieve tension and at the same time help considerably in reaching clear decisions.

2. Cut down searching time. Delegate these tasks to your subordinates whenever possible.

3. Alternate the hard and easy tasks. Loss of efficiency results when you attempt to perform one hard task after another. And tension tends to build up.

4. Plan to group specialized tasks together. This means you'll only have to build up once to the high-pressure specialized job.

5. Make waiting time productive time. This will cut down on the stack of work at end of the day.

6. Change tasks about every two hours. Long stretches at the same job decrease efficiency and build up nervous and physical strain.

7. If the task can't be changed—then change the tempo. It will give you a minute to relax and relieve the boredom of a tedious job.

8. Start the difficult or disliked task first. You'll get it off your mind. And it's easier to do it when you're fresh.

9. Learn the relaxed approach to every job. Granted, it's probably against your nature, but everything can be done more efficiently if one is relaxed mentally and physically before starting the chore.

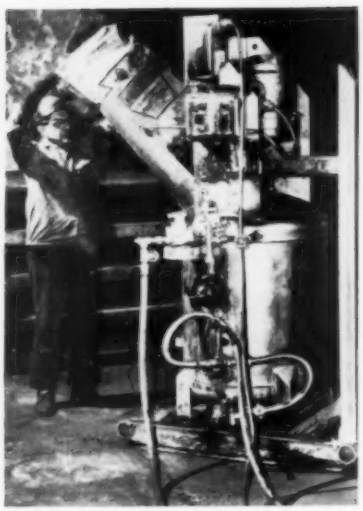
10. Don't let unfinished tasks become a monkey on your back. Don't start jobs you can't finish. Set them aside completely until circumstances permit their completion without undue interruption.

11. Fix sub-goals. They can be tension-breakers in the effort toward completing major goals.

12. Don't let petty details obscure the essentials.

13. Plan crash periods of business throughout the day instead of one long grind.

14. Decrease the backtracking. Most of it is sheer waste.



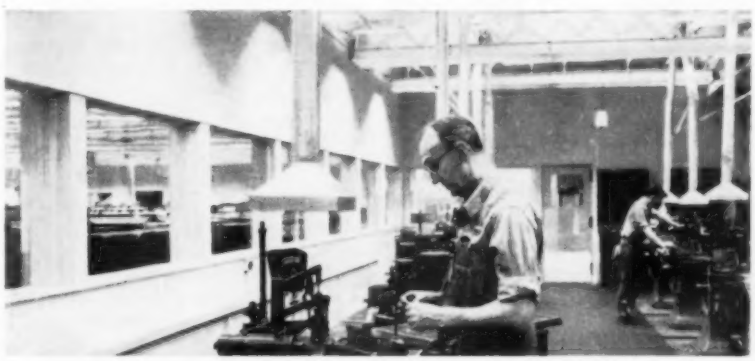
Cuts blacking time by 70%

A salvaged spray tank has cut job time by 70% and improved the quality of blacking at Kaiser Steel Corporation, Fontana, Calif.

Blacking was formerly mixed in a vat by hand and then transported to the work area in barrels by crane. The finishers had to dip 5-gal. buckets into the barrels to get the blacking to spray on ingot mold cores. It took numerous trips to refill the buckets. And the blacking in the storage barrels settled and required repeated stirring throughout the day. Also, the blacking was spotty because air agitation in the mixing vat produced air bubbles.

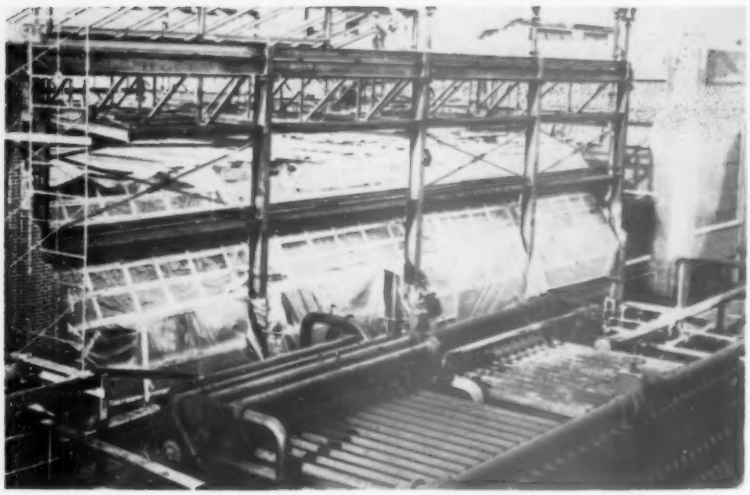
Under the new system, the pressure spray tank is located near the finishing benches. The tank provides constant mechanical agitation resulting in a uniform mixture. It eliminates the air bubbles, too. No other handling operations are required. The mixture is sprayed on the core through hoses attached to the tank.

Cost of adapting the tank to the operation was $200. This included connecting the tank to existing water and air lines, plus relocating an electrical power supply. A similar tank purchased new would have cost about $1100.



LIGHT AND HEAT FROM SAME SOURCE

High-intensity lighting is paying off twice at L. S. T. Typography Company, Chicago. Power Groove fluorescent lamps (General Electric Company, Cleveland) not only provide a shadow-free 200 foot-candles of light, but salvageable heat as well. Air-to-air heat pumps recirculate the hot air minus the dirt and odors. In most plants a ventilating system just removes the hot air, without making use of it.



FIRE-RAVAGED PLANT REOPENS IN 12 DAYS

This partially destroyed Union Carbide Chemicals Company plant in Whiting, Ind., was back in production just 12 days after fire struck the building in mid-winter. How? A shield of tough polyethylene film was erected within the framework of the building as a temporary enclosure to protect workers from the elements. The interior was heated for maximum comfort. A translucent type of film (Visking Company, Chicago) was used so daylight could supplement artificial lighting.

No sound or light—but paging tickles

There are no sounds or flashing lights involved in the personnel paging system at Oldsmobile Division (Lansing, Mich.) of General Motors Corporation. Supervisors are literally tickled when they're wanted anywhere in the final assembly and engine manufacturing areas.

Replacing a whistle-and-buzzer system, the silent paging method is based on a vibrator receiving device that's worn on the belt of each key supervisor. When a supervisor is being paged, the device—a bit larger than a cigarette case—vibrates as the result of an electronic signal sent out by a centrally located transmitter unit. When the wearer feels the sensation, he picks up the nearest phone and calls the transmitter operator who then relays the message to him.

The system (AC Spark Plug Division of GM, Flint, Mich.) consists of two signal transmitters and 52 receivers. A 32,000-ft. antenna complex carries the signals. The dual transmitters cover an area of nearly 4-million square feet at the Oldsmobile plant.

Fast photo charts

Photographing charts and forms by Polaroid camera and then projecting the slides in the conference room is a real time- and money-saver at Union Carbide Nuclear Company, Grand Junction, Colo.

It used to take a highly paid draftsman to prepare 3x3½-ft. charts, large enough to be seen by all 25 executives attending the monthly management meetings. In all, some 50 charts a month illustrating such subjects as production control and operating expenses had to be composed. Since all the data contained on these charts weren't available until a few days before the meeting, time was a big factor.

Now the data are first prepared on a conventional 8x11-in. paper, mostly by typewriter, then photographed with a Polaroid camera. Since the camera turns out a transparency in just 60 seconds, mistakes can be caught without wasting time.

Polaroid cameras are also used by all safety engineers at the plant. A photograph of every accident is taken on the spot. If a piece of machinery breaks down, photos are shot from every angle. Such photos are proving valuable in preventing future accidents or breakdowns.

Pumping system apes gas station

Is special pumping equipment for flammable liquids setting your plant back a pretty penny? Zep Manufacturing Corporation, Atlanta, pumps its liquids—on a production basis—through a bank of six reconditioned gasoline pumps.

Each pump is connected to a storage tank containing such products as insecticides, solvent metal cleaners, and motor cleaners. Originally designed to handle flammables, the tanks can pump the liquids with perfect safety. They come equipped with precision gallonage meters and hand-operated nozzles.

The reconditioned tanks were purchased at an average cost of $225 per unit.

1. STEPPING IN SAFETY

2. SWINGING IN SAFETY

PUTTING AN END TO TWO COMMON PLANT HAZARDS

In 1960 Armco Steel Corporation had only 2.6 lost-time accidents for every million man-hours worked. (And that was no accident!) A number of inexpensive yet effective plant-made devices helped cut down on injuries. Here are two examples:

1. A portable metal bridge (left photo) eliminates danger of tripping over cables from a welding unit. It aids maintenance and also protects the wire from the wear and tear of pedestrian traffic.

2. For all overhead welding jobs, a steel cable is used to support a fire extinguisher, a safety belt in front of the welder, and a hand line behind him. The hand line is used to raise or lower equipment to and from the floor below.

Poultry patrol bags booze burglar

Hoot mon! It's not enough that machines are doing a man's work—now birds are getting into the act.

At George Ballantine & Son Ltd., Glasgow, Scotland, Hymie (the gander) MacPherson, security guard supreme, is giving thieves the bird. Quite a man, this Hymie. He's got 18 assistants—all female.

When this gander and his poultry patrol get wind of an intruder in the distillery plant, they really tell him off. In gooseese, they order the burglar to halt, at the same time alerting the human guards.

But woe to Hymie or any of his lady friends if they slough off on the job. They're liable to get the axe. This is especially true around Christmas time.

This winged force provides one benefit human guards can't match. Proceeds of their eggs—sold by the company—are donated to charity.

Meters pinpoint department power use

Some 200 polyphase watt-hour meters, like those above, are checks against electrical waste at Ford Motor Company's River Rouge, Mich., plant. They keep track of power usage on a department-by-department basis. This puts the responsibility for conservation directly upon the individual supervisor. Here's how the system works:

Power is generated at the company's power station and sent underground to load-center switching areas. There individual meters measure the kilowatt hours of energy required for each component.

According to E. A. Anderson, Ford engineer, typical savings from the use of these submetering installations include:

- Reduction of demand charge by careful rescheduling of work loads by each foreman.
- Avoidance of waste by shutting off power not required.
- Improvement of power factor by not operating large induction motors at light loads, which usually means inefficiency.

When does it pay to submeter a department? Ford uses this criteria: If the monthly power bill is higher than the cost of installing meters, the metering installation is economically justified.

The submetering system is manufactured by General Electric Company, Somersworth, N. H.

YOU BE THE ARBITRATOR

THE CASE OF

The expired expediter

Out of the experience of the American Arbitration Association

In a medium-sized manufacturing company supervisors used to receive phone inquiries about work in progress and pass them on to John J., an "order expediter" and a member of the bargaining unit. John located the work on the floor and reported back. Then the supervisor relayed the desired data to the customer. This had been the practice for a number of years.

Later, a mechanical system of record-keeping was installed, making it possible for supervisors to give customers all the information they wanted on the spot. Occasionally, perhaps once a day, it would be necessary for someone to check progress of the work personally, in which case the supervisor would do it himself. Under the new system, the company decided to eliminate John's job.

That led to a grievance. "You can't take work away from a bargaining unit employee and give it to a supervisor," argued the shop steward. "As long as there is expediting work to be done it belongs to the order expediter."

"The order expediter's job has been eliminated by introduction of new machines," answered the plant manager. "No one is doing the old-style expediting except in an emergency."

Eventually the case went to arbitration. Suppose you were the arbitrator. How would you rule?

For the actual decision turn to page 176

Funneling butts ends fire hazard

You can stress the importance of putting out butts until you're blue in the face, yet some workers will always smoke 'em and toss 'em. This can be a fire hazard even if they're put in a cigarette can. There is always the joker who'll toss paper and other junk in, too.

At Convair Division (Fort Worth, Tex.) of General Dynamics Corporation, this funneled can has licked the problem. Now there's no need to extinguish cigarettes. The plant-devised cans are made of standard production parts.

Do-it-yourself plant paint remover

This in-plant gravel pit is practically an automatic housekeeper at Jessop Steel Company's Chicago plant. It's built under the fabricating area, especially to catch paint.

Instead of having to scrape a concrete floor many times a year, all the plant needs to do is turn over its gravel a little, and the place looks like new.

The pit was built into the plant at the time of construction. Hot-rolled mild-steel angles form a coping frame around the pit. It measures 40x20 feet and is 8 inches deep. Some 24 tons of ¾-in. crushed stones—costing $75—give the plant 800 square feet of practically maintenance-free area.

Ore to copper without melting

The conventional melting process for producing copper will be outmoded at the new plant that Marinduque Iron Mines Agents, Inc. (Manila), is building on Mindanao Island in the Philippines.

Copper is to be produced at the $23-million plant from low-grade ore by means of chemical leaching and gaseous reduction. The copper will then be converted into strip, tubing, and wire by newly developed rolling methods (E. W. Bliss Company, Canton, Ohio).

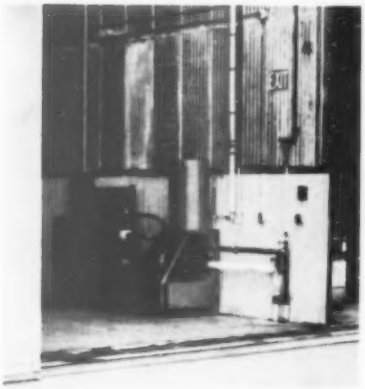
These methods will slash costs in two ways: First, the capital cost of the installation for producing high-purity copper is 40% less than installations for conventional smelting, refining, and casting plants. Second, the cost of facilities for producing strip and tubing from copper powder

is 50% less than for fabricating techniques starting from cake, ingot, or billets.

The new copper chemical process also makes it possible to obtain high-grade copper products from any starting material that is now being used by the industry.

Chemetals Corporation, New York, holds the licensing rights for extracting copper from ores by chemical means.

Foster Wheeler Corporation, New York, is the prime contractor for the new Mindanao plant, which expects to produce 14,000 tons of fabricated copper products per year. In addition, the plant will produce about 100,000 tons of ammonium sulfate fertilizer yearly.

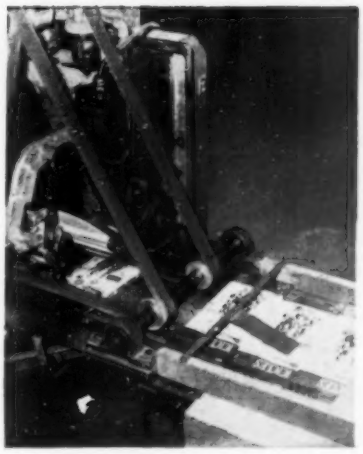


Hot oil fights ice

If the doors in your plant have a tendency to freeze shut during the winter, try this idea on for size. Hot oil is making sure frozen doors aren't a problem at American Can Company's Westchester County (N.Y.) airport hangar. A 48-kw., 160,000-Btu.-per-hour fluid heat transfer unit does the job.

The electric heater (Hynes Electric Heating Company, Mountainside, N.J.) is connected with pipelines embedded in concrete just under the hangar doors. Oil heated to 85 F. keeps the temperature of the rails and adjacent areas well above the freezing point.

The heater is used only when icing conditions prevail or are predicted. When bad weather is forecast well ahead, the heater is started up manually several hours in advance. This eliminates any danger of sticking doors.



Tailor-made answer to overprinting

A precision-molded rubber plate with sponge backing and a quick-drying ink solved a knotty package marking problem for Ben-Mont Papers, Inc., Bennington, Vt.

The cellophane wrappers for the package had been printed with some obsolete information and had to be overprinted. The package itself contained only soft Christmas tree tinsel, so there was nothing firm behind the marking surface. The only way the wrapper could be overprinted without increasing labor costs would be just after the package left the wrapping machine at the end of the production line.

The answer lay in a unitized printing head (Markem Machine Company, Keene, N. H.) installed on the production line. It was synchronized to overprint each package automatically as it stopped for a fraction of a second. The plate and sponge backing insured that the stamp would not tear the wrapper, and the quick-drying ink allowed the packages to be put in cartons promptly without smudging.

Contributions from readers reporting experiences will be welcomed. No need for fancy writing; just a clear, concise statement of facts. If you have photos or drawings, be sure to include. We'll edit for the Case Book. Contributions accepted will be paid for at time of publication. Address: Case Book Editor, FACTORY, 330 West 42nd St., New York 36.

CASE BOOK CAPSULES

Ray guns that transmit voices secretly and silently by means of invisible infra-red beams have been produced by Minneapolis-Honeywell Regulator Co., Minneapolis. Used for plant security, hand-held units have a 3-mile range, while larger systems transmit 20 miles.

An 8000-ton hydraulic press is being built of pre-stressed ferrous concrete in the Soviet Union. The cost is said to be only one-quarter that of its conventional metal counterpart.

X-ray films can be reproduced in one minute with a new machine designed by Copymate Co., Newport Beach, Calif. The reproduction is not affected by heat or humidity during storage.

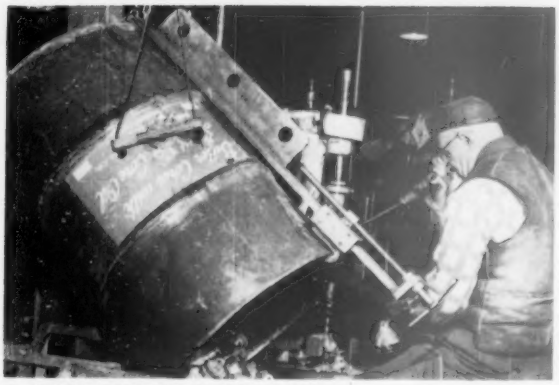
Air-lubricated bearings that generate their own air film when rotated at high speeds, have been developed by Chrysler Corp., Detroit. Elimination of metal-to-metal contact makes them almost indestructible.

High-speed computer print-out equipment can convert data from magnetic tapes into plain language on microfilm at speeds to 20,000 characters per second. The equipment is now being marketed by Recordak Corp., New York.

Thermoelectric device, smaller than a paper clip, can freeze or boil a drop of water on power from two flashlight batteries. Hughes Aircraft Co., Culver City, Calif., designed the unit.

Reinforced concrete chimney, 630 feet high, is being built at Philadelphia Electric Co., Johnstown, Pa., by Rust Engineering Co., Pittsburgh. It's the largest in the East and is designed to reduce air pollution by pushing dust and gases into the upper air stream.

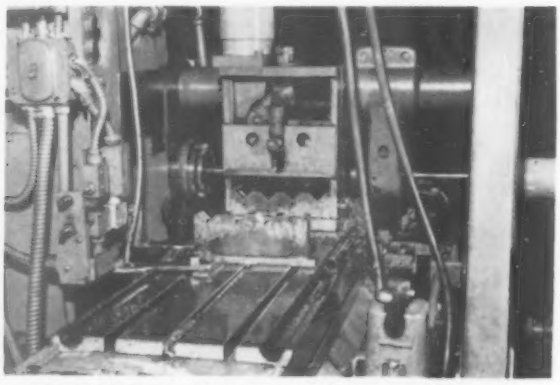
Smog is big business in Southern California. Industry throughout the area has spent $87-million on air-pollution control equipment since 1948, according to the Los Angeles Chamber of Commerce.



1. CHAIN TILTER SAVES BACKS.

2. HOPPER KEEPS RODS HOPPING.

3. MERRY-GO-ROUND SPEEDS SOLDERING.



4. STREAMLINED MILLER CUTS LIKE FOUR.

Low-cost cost-cutters pay off big . . .

. . . at Universal Form Clamp Company, Chicago. Nominal expenditures for plant-made devices have boosted efficiency and production without raising labor costs. Here are four typical examples of ingenuity that might pay off for you:

1. Tilts without muscles. It cost only $75 for Universal to build this barrel pick-up device. Semi-finished castings are brought to the work bench in 450-lb. barrels. Two men used to have the back-breaking chore of lifting the barrels and dumping the castings on the floor. Then the machine operator had to shovel them into his work bench before the operation could begin.

The pick-up device, combined with a chain-hoist assembly, has changed all that. It's now a one-man job. The operator attaches the clamp, then swings the barrel to the work table with the hoist. To tip the barrel he just moves the chain to a lower hole on the clamp (photo). Parts come tumbling out in a flow regulated by the tilt angle.

2. Speeds feeding. Hopper feeding of washers has boosted to 850 per hour the number of finished rods passing through the cold heading machine in photo. When the washers had to be placed on rods by hand, the figure was only 150.

The operator just feeds the rod into the machine, and the washer automatically drops into position for securing. Price of feeder: $75.

3. Lazy Susan's not lazy. In fact, it has boosted production 65%. This merry-go-round soldering table, built for $650, replaces a 2x4 wooden jig. It's used for joining a flat plate to a long strip. With the old method, two operators had to set up a row of pieces in the wooden jig, then heat the strips with a soldering iron. Production was low and replacement costs for the iron's copper tips were high.

Although two men are still needed, they work at higher efficiency. As the table rotates, one man clamps the long strip along the edge, places the flat plate on top of it. Each assembly passes under gas burners (left of photo) where parts are heated to soldering temperature. Second man lays solder on joints.

4. Cuts four at a time. This streamlined milling machine makes four straddle cuts at a time on ¾-round bars. The conventional-type miller formerly used made only one. Built for $1300, the straddle-type machine uses eight cutters mounted on a single shaft. The hydraulic vise (middle of photo) holds the four bars firmly in position.

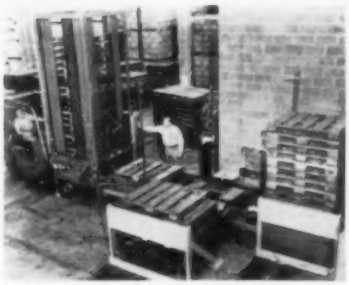
Electrical interlocks prevent cutting until the bars are securely clamped. And switches regulate the cutting depth.

Graph tattles on machine downtime

A minute-by-minute report on the operation of its 15 screw machines is a key to efficiency at Centralab Electronics Division (Milwaukee) of Globe-Union, Inc. This Operation Recorder (Esterline Angus Instrument Company, Speedway, Ind.) provides a permanent graph of on-off time for all machines.

These records are used for setting-up and studying incentive pay scales to arrive at definite maintenance schedules, to anticipate replacements, and to evaluate new operating or tooling procedures.

For example, during a short production run, methods engineers check operating time, as shown by the graph, against a piece count. They can then pinpoint the time needed for a particular run and arrange schedules. Since the Recorder shows how many minutes and hours each machine operates, engineers can predict when maintenance will be needed.



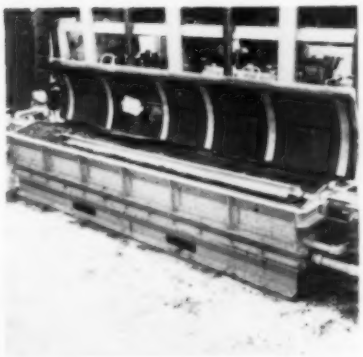
Catching accidents before they happen

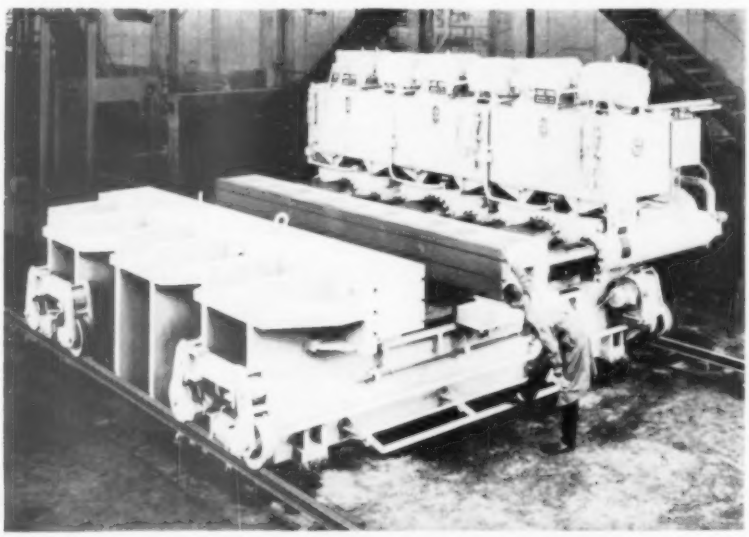
Broken pallets are a threat to any plant. At best they disrupt production or cause product damage and at worst they cause serious injuries to workers. Yet too many plants accept this danger as an occupational hazard, have no inspection system for pallets.

At Schaeffer Brewing Company, Brooklyn, N. Y., an automatic pallet inspection system assures safety. Key is this pallet dispenser (Alvey Conveyor Manufacturing Company, St. Louis). It's equipped with a special lift device that enables the inspector to scan the tops and bottoms of the pallets.

By pushbutton control the inspector can dispatch a damaged pallet to an Alvey stacker (center in photo) where it's picked up by maintenance people for repair. Or if a pallet is O.K., he can send it to a second stacker (right) from which it returns to operation.

The dispenser can accommodate up to 20 pallets at a time.





THREE-IN-ONE PRESS RIDES ON TRACKS

These three forming presses can act in unison or independently at LeTourneau-Westinghouse Company's Indianapolis plant. What's more, the outer two presses can move on tracks anywhere they're needed throughout the plant. The inner press is stationary. The presses have a total ram pressure of 2250 tons, a combined weight of 400,000 pounds, and travel of 6 feet. The press (Lake Erie Machinery Corporation, Buffalo) is 20 feet wide when the three machines work as a unit. Each press is powered by a 60-hp. motor, with individual starters.

Casket deburrs with a double motion

No, this is not a coffin equipped with a hot-water bottle for a cold stiff. It's a plant-made machine for deburring spurs, ranging from 7 to 15 feet in length, at Boeing Airplane Company, Seattle, Wash.

The spars are held by rods extending through the ends of the 16-ft. machine. They oscillate longitudinally through pressurized abrasive to do the deburring. To prevent the abrasive from cutting right through the spar itself, pressure is provided by six vibrators mounted underneath the tank bottom on individual stiffener pads. Thus, the spars oscillate on a fluid rather than solid surface.

That's where the hot-water bottle comes in. It's connected to a gauge on top to measure pressure.

RIGHT WAY

WRONG WAY

Sore-back dummy preaches safety

This fugitive from a lumber mill really puts his back into his work—often with dire results. He's used for safety demonstrations at Dayco Corporation (Dayton, Ohio).

The wooden fall guy shows employees what can happen if they lift heavy loads the wrong way—his backbone collapses. If the load is lifted correctly, nothing happens.

The device works on a simple leverage principle. There are movable joints at the ankles, knees, hips, and shoulders. The spine is a series of wooden blocks held together by elastic strips. The employee provides the lifting power for the dummy by means of a handle at the base of the spine.

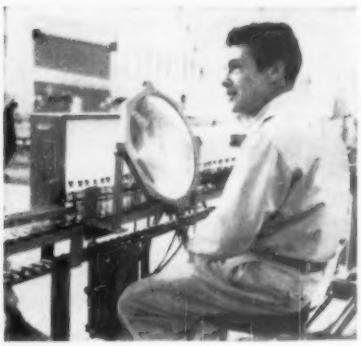
If the load is properly placed, Pinocchio's knees are bent and his back is straight—almost vertical. When the employee applies pressure for lifting, maximum strain is placed upon the dummy's legs, not the back. He thus reaches a standing position without mishap.

The photo on the right tells the story of what would happen if a load is positioned too far forward on an employee. It causes the dummy's back to bend, putting it under a strain. And when the lift is attempted, the extra strain causes the building-block backbone almost to explode apart.

The effect on the audience is instantaneous, according to Ray Hart, safety director. "We can talk forever about the right and wrong way to lift and still not reach a lot of people. But 30 seconds of this demonstration and everyone is thoroughly impressed. Although the initial reaction to the backbone explosion is usually laughter, a sobering effect sets in later as employees realize that this could happen to the human spine.

Cost of the dummy: Only $2 in materials and $10 in labor.

Inspector looks at the big picture



Visual inspection for impurities is a production-line function at the recently constructed Bacardi y Cia, S.A., plant in Mexico City. No handling is necessary.

After the bottles of rum are filled, they pass by an inspector who checks the contents through a stationary magnifying glass set up right on the production line. A diffused light cabinet at back of the conveyor and directly in line with the magnifying glass allows him to check for minute foreign particles.

Result: An accurate visual check of the product with no time lost in manual handling.

Robot reader

An electronic page scanner, which translates business documents directly into computerese, is simplifying accounting at Cleveland Electric Illuminating Company, Cleveland.

The machine is capable of translating the information into punched paper tape at the rate of 240 characters per minute.

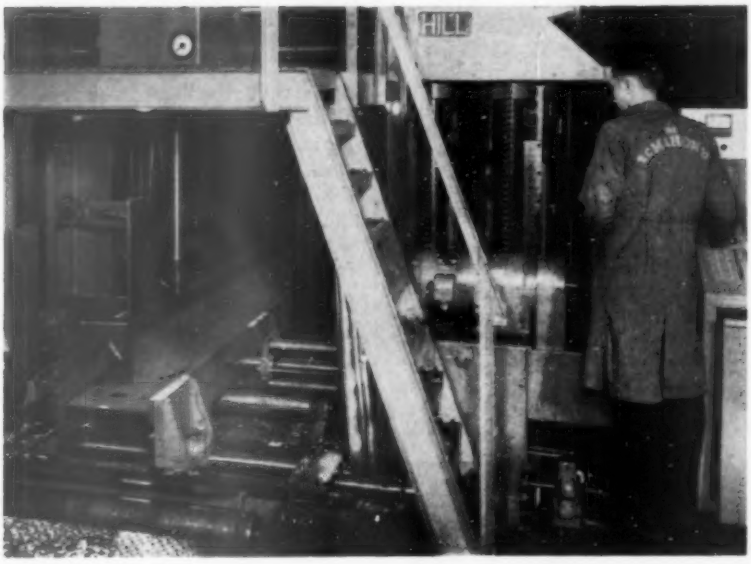
Made by Farrington Manufacturing Company (Needham Heights, Mass.), these machines cost from $95,000 to $175,000. The more expensive units, using magnetic tape, can do 340 characters per minute.

Up-and-down conveyor does double duty

A slit in this washer allows the monorail conveyor to do double duty at Hotpoint (Chicago) Division of General Electric Company. Machined parts carried on the bottom hangers can get a bath while raw parts carried on the top are able to bypass the washer. Neoprene seals keep the steam loss to a minimum in spite of the slit.

Raw parts are kept from passing through the washer for two reasons: (1) to prevent the parts from heating up and changing machining dimensions when they cool; (2) to eliminate the added cost of washing the parts more than once.

The washer is manufactured by DeVilbiss Company, Toledo, Ohio.



Numerical control slashes costs

A numerically controlled beam and column drilling machine has cut the cost of producing holes in drilled patterns by more than 85% at R. C. Mahon Company's Detroit plant. Formerly, the company used layout, spacer punching, reaming, and radial drilling methods.

The new machine (Walter P. Hill, Inc., Detroit) consists of motorized conveyors—incoming, beam-feed roller, and run-out types—as well as a high-speed drilling machine. It has two opposed single spindles and one vertical spindle.

One operator controls the entire system. The machine can bore or gun-drill ¾-in.-dia. holes in steel at feeds up to 30 inches per minute. Here's how it works:

The beams to be drilled are loaded on the incoming conveyor. By push-button control the operator then feeds the pieces onto the beam-feed conveyor. Then the beam is advanced hydraulically, clamped, and drilled via tape control.

When the drilling is completed, the operator pushes another button and the beam is discharged into a run-out conveyor. Several beams can be stored temporarily on the conveyor while they're awaiting pick-up by overhead crane.

Electronic chef dishes out formula

Selecting and weighing the ingredients for re-orders of grinding wheels is an electronic function at Bay State Abrasive Products Company, Westboro, Mass.

The first time Bay State receives an order for a grinding wheel, a formula is made up to fit the specific needs of the customer. The formula is then fed into an IBM computer, which prepares a punched card containing this information.

As soon as a repeat order is received, the operator feeds the formula card back into the computer together with the volume desired. The electronic chef calculates the correct volume of ingredients needed to fill the order and punches a second card with this information. This card is then fed into a plant-designed mixmaster (photo). This sets off electronic impulses that select and weigh the ingredients automatically from storage bins above. Accurate? It sure is. Down to a millionth of a pound.

The final step is to gravity-feed the precise volume of each ingredient through a system of pipes to the container in which the order is being prepared.

This electronic method has eliminated any possibility of human error and has speeded up process time. It was designed by Bay State engineers in conjunction with Howe Scale Company, Rutland, Vt.

A STEP BACKWARDS TO PROGRESS

Even with today's automatic equipment, worker dexterity is not a lost art. At Allis-Chalmers Manufacturing Company (Milwaukee) hand welding is used to produce a nuclear reactor grid plate, even though it would be a relatively simple operation to program a machine to do the job. The need for ultra-high quality requires the multi-pass manual operation. Photo shows the welder using an inert-gas process with filler wire for the first pass of the cycle.

Trading in tools like used cars

Want to buy new machine tools? You can now trade in your old tools on 'em. The new plan has been set up by Pratt & Whitney, Inc., West Hartford, Conn., subsidiary of Fairbanks Whitney Corporation.

The company is accepting trade-ins of surplus machine tools of any manufacture as part payment or credit toward the purchase of any new P&W product.

Machine Trading Corporation, a new corporate unit of Fairbanks Whitney has been established to handle surplus tools. It will later resell the tools at a profit.

If a customer wants to trade in an old lathe on the purchase of new equipment, P&W calls in a representative of the new company, who evaluates the machine and offers an amount to be issued as credit. As for as the customer is concerned, he deals with one company only. And credit toward a new purchase, instead of cash, cuts his taxes.

Reprints of the Plant Operations Case Book are available. Price 50¢. For quantity prices, write Reader Service Department, FACTORY, 330 W. 42nd St., New York 36.

Three-way positioner drys, stores, moves

Some 7000 transistors are dried, stored, and transported to the next work station in this work positioner at Radio Corporation of America's Somerville, N. J., plant.

The transistors are removed from the etching tank, then placed in the positioner (Lowerator Division of American Machine & Foundry Company, New York). As a tray is placed in the box, the previous tray is automatically lowered to the next position. Operators don't have to do any bending.

At top and bottom of the positioner warm air flows over and dries the transistors. As soon as the positioner is loaded, it can be wheeled to the next work position.

Unloading works in reverse. As the top tray is unloaded, the next tray automatically comes into position at the top of the positioner.

In the past, each transistor had to be dried over a small blower. Rehandling, exposure to the air, and inefficient drying resulted in a high rate of rejects.

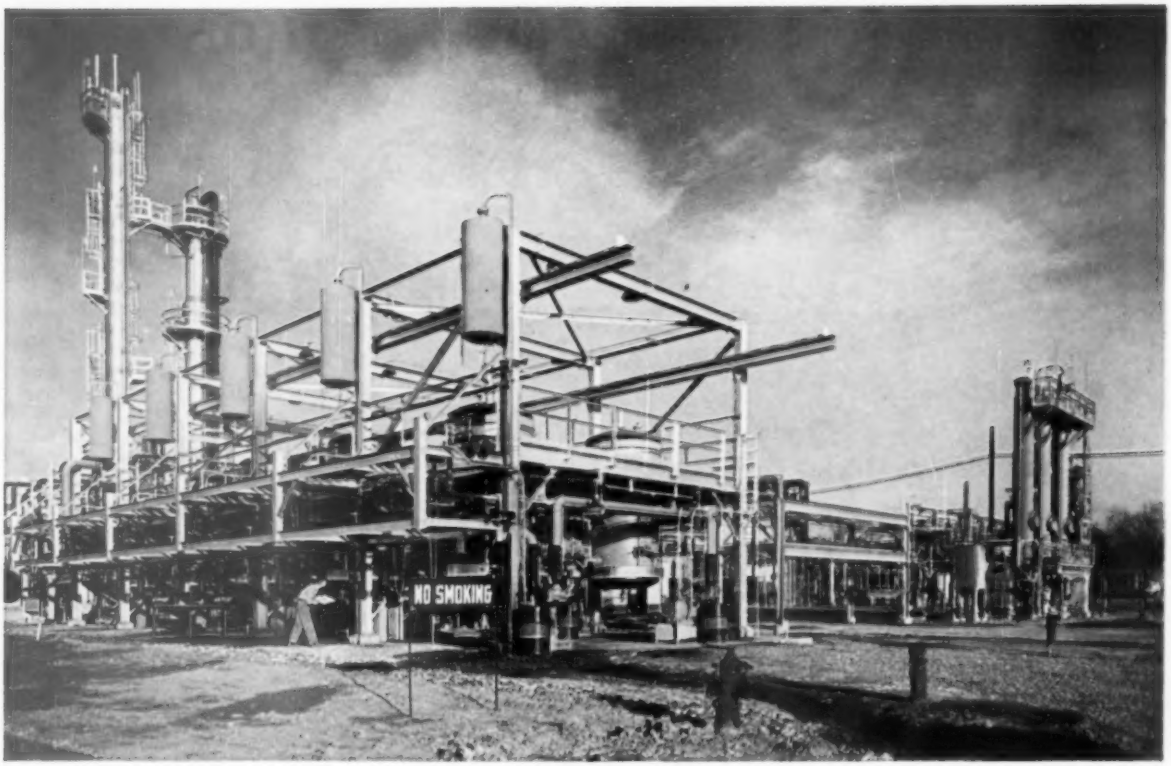
YOU BE THE ARBITRATOR

Continued from page 170

The award—The arbitrator said the company had a right to eliminate jobs or set up new ones, as long as new jobs outside the bargaining unit didn't include duties the contract had assigned to unit employees. It was quite all right, he concluded, for supervisors to answer phone inquiries from their records and dispense with the order expediter to that extent.

However, he added, calling something an "emergency" didn't necessarily make it so. When a supervisor had to make a personal inspection of work, he was doing what John used to do. Even if it happened only once a day, it was work that belonged to a bargaining unit employee. The arbitrator added that it would be unreasonable for an expediter to wait around all day just for that one assignment. Management could rearrange the work for greater efficiency provided the expediting detail was kept in the unit.

Caution: The award in this case is not an indication of how other arbitrators might rule in apparently similar cases. Arbitrators do not follow precedents. Each case is decided on the basis of the particular history, contract, testimony and other facts involved.



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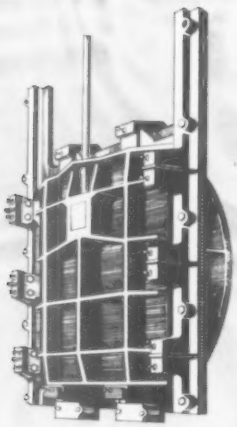
FACING AN INDUSTRIAL WATER CONTROL PROBLEM ?



Armco gates offer efficiency, durability

Wherever industry requires gates for controlling water, you save money by specifying gates that operate efficiently with minimum maintenance. Armco Gates, widely used for more than 50 years, have an enviable reputation for economy, efficiency and durability.

Armco Sluice Gate in drawing is typical cast-iron model. Seat facings of machined bronze or cast iron, adjustable wedges. Supplied in either bronze or stainless steel stems.

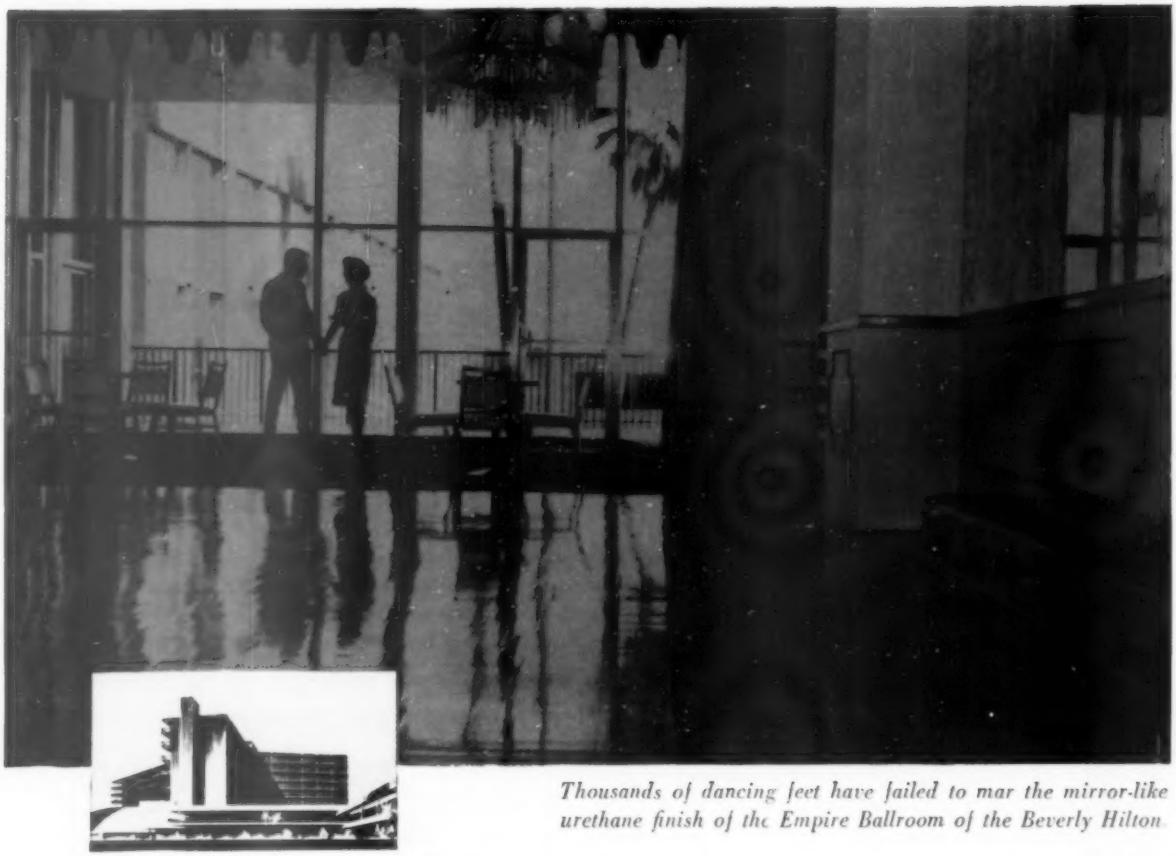
In Armco's *complete* line of sluice, slide, flap, roller, radial, and other types of gates, you will find the right one to meet your requirements. Wide choice of gate accessories. For our complete gate catalog, write us on your company's letterhead. Armco Drainage & Metal Products, Inc., 5191 Curtis Street, Middletown, Ohio.

ARMCO Drainage & Metal Products

you'd never believe it, but—

the glamorous Beverly Hilton

had a coating maintenance problem like yours...



Thousands of dancing feet have failed to mar the mirror-like urethane finish of the Empire Ballroom of the Beverly Hilton

One of the world's most glamorous hotels, the Beverly Hilton in Beverly Hills, Calif., has maintenance problems that would stagger many elegant, self-contained communities. One of the most persistent problems is that of keeping painted and coated surfaces looking their sparkling best while exposed to the wear and tear of thousands of guests, diners and members of society that visit this resort mecca each year.

A new program by Beverly Hilton's management promises to reduce this problem by coating many of the hotel's high-wear or high-traffic areas with urethane finishes — such as the dance floors of the sumptuous Empire Room and Star on the Roof lounge, the barbecue ovens of Trader Vic's exotic Polynesian restaurant, the swimming pool make-up tank, outdoor furniture, and over 6,000 feet of balcony railing.

Urethane coatings have very high resistance to wear, weathering, cleaning chemicals and heat. Owing to the unique chemical reaction that takes place as applied, the resulting finish has a durable gloss and unusual film flexibility, and is up to six times as abrasion resistant as the finest-quality spar varnishes.

Urethane coatings are formulated by a number of major paint companies from chemicals manufactured by Mobay. For further field-tested performance data and sources of ready supply, write Mobay Chemical Company, Code FA-6, Pittsburgh 5, Pa.

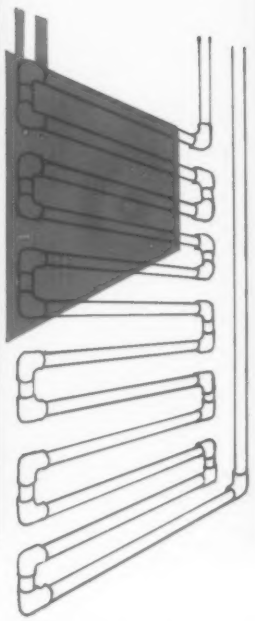
MOBAY CHEMICAL CO.
Pittsburgh 5, Pennsylvania

MOBAY

C-5

NEW MULTI-ZONE PLATECOIL®

SAVES TANK SPACE

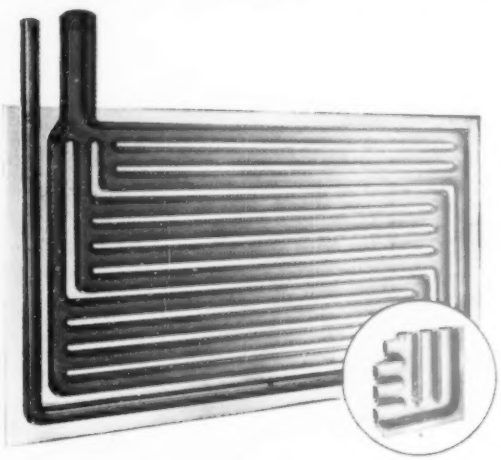


Operating Pressures up to 250 psi

Patented

Compact PLATECOIL units have replaced pipe coils in thousands of tank and process heating and cooling applications. High heat transfer per unit of surface and greater overall effective heat transfer surface permit the use of PLATECOIL which takes up less valuable tank space than pipe coils of equivalent capacity. In many cases this eliminates the need for additional tanks by increasing the capacity of existing tanks or processing vessels.

NOW – MORE TANK AND PROCESS EFFICIENCY THROUGH FASTER START-UP: LESS DOWNTIME



High heat transfer per square foot of surface and greater effective surface through better steam distribution produce a reserve heating capacity in the new MULTI-ZONE PLATECOIL. This reserve capacity delivers amazing heat transfer under o v e r l o a d conditions during tank and process "start-up" periods. "Downtime" is cut and the same heating capacity provides fast recovery of desired temperatures after introduction of "cold" work loads to preserve overall processing efficiency.

In addition to performance advantages, PLATECOIL presents substantial cost advantages. PLATECOIL is lightweight and easy to install. Streamlined PLATECOIL surfaces do not tend to collect deposits as do pipe coils and cleaning is a simple, economical operation. All stainless steel and alloy PLATECOIL units affected by cold working are annealed and pickled after fabrication to return the metal to its original condition and thus eliminate the probability of corrosion due to internal stresses and carbide precipitation.

PLATECOIL is available in standard styles, sizes and materials to fit a wide variety of applications. A complete line of accessories to facilitate engineering and installation adds to PLATECOIL versatility. Special PLATECOIL can be factory-fabricated to special needs.

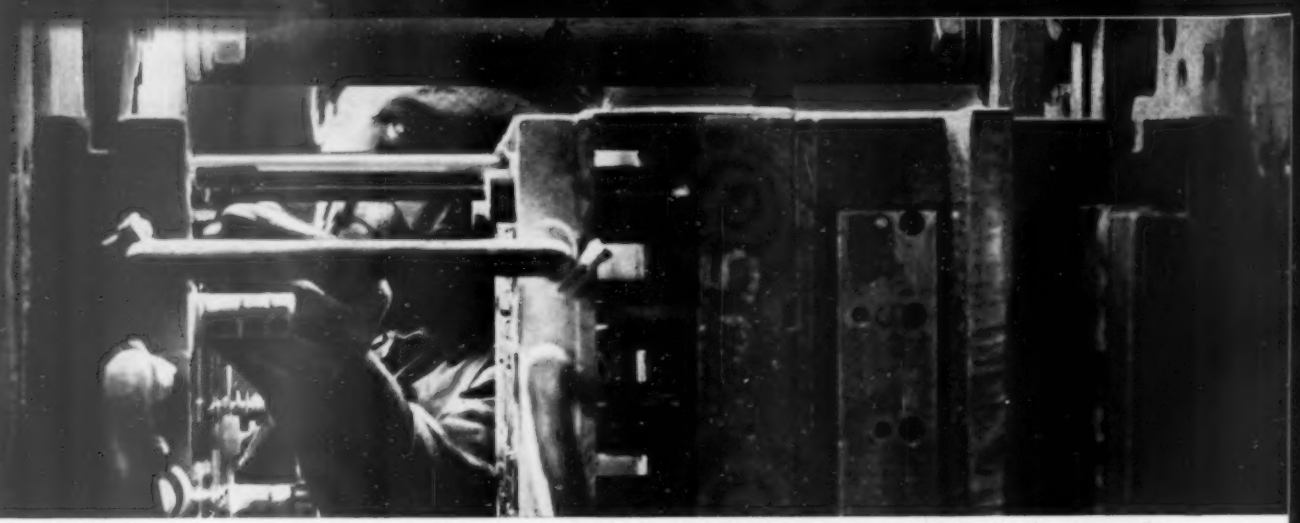
Send for Bulletin P60 for complete data.

Tranter Manufacturing, Inc.

LANSING 9, MICHIGAN

PLATECOIL® DIVISION

For more facts Circle 499 on Reader Service Card



Shell Tellus Oils are refined and formulated to meet exacting hydraulic service requirements, such as in this forming machine.

PHOTO COURTESY ATLANTIC PLASTICS INC., STAMFORD, CONNECTICUT

BULLETIN:

Shell provides a quick 6-point check list for hydraulic oils: Use it to pick the right oil for your needs

Selecting the proper hydraulic fluid for your equipment can be one of your most important decisions. And it can pay off in many ways. Less down time. Lower cost per unit. Longer equipment life.

Here are six bench marks to help you pick the best hydraulic oil for your plant requirements.

1. Does it have good oxidation stability? Oxidized hydraulic oil can form gums, lacquers and other deposits which may foul moving parts. Shell Tellus Oils are carefully refined to remove unstable, sludge-forming components, then fortified with a Shell-developed oxidation inhibitor.

2. Will it resist foaming and emulsification? Pump chatter and erratic operation are often the result of pump cavitation, brought on by oil foaming. Tellus® Oils contain powerful additives to help prevent foaming.

They also contain a selected inhibitor to combat effects of moisture that might be in the system.

3. Does it fight rust and corrosion? It is difficult to exclude all moisture from a hydraulic system. And moisture can form troublesome rust. Shell Tellus Oils have been carefully compounded to resist corrosion.

4. What are its lubrication qualities in continuous service? Shell Tellus Oils form a clinging, oily film on mating metal surfaces. This maintains a constant guard against wear.

5. How does it react to temperature changes? This is a key factor in the performance of hydraulic equipment. Careful selection of the proper viscosity grade of Tellus assures satisfactory operation of your system over its entire temperature range.

6. Is it available in several viscosity grades? Shell Tellus Oils are available in a broad range of viscosity grades. There's a special grade for virtually every hydraulic requirement.

Ask your Shell Industrial Products Representative for facts on Tellus Oils. Or write: Shell Oil Co., 50 West 50th St., New York 20, N. Y.

A message to manufacturers of hydraulic equipment

There is a Shell Tellus Oil suited for your equipment.

1. Your customers can get Tellus Oils at Shell depots everywhere. Readily available throughout the world.

2. Quality is consistently high. Tellus always delivers top performance.

SHELL

A BULLETIN FROM SHELL
—where 1,997 scientists are working to provide better products for industry

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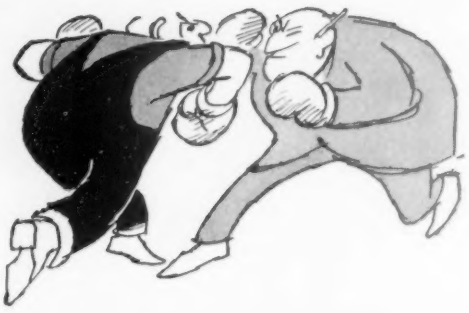
HUMAN RELATIONS

By V. E. LUNARDI, Assistant Editor, FACTORY



Labor throws 1-2 punch

With rumblings of the 32-hour week in the background, labor let go two more wallops. In quick succession came weekly salaries for plant workers and periodic one-week shutdowns. Both were thrown into the ring by the United Auto Workers, Detroit.

Increasing automation and subsequent unemployment are spawning weekly salaries, says Leonard Woodcock, UAW vice-president. Automated production lines are making obsolete the hourly wage and piecework rates now in effect. Eventually, this pay system will no longer be equitable. Then industry will have to consider salaries, concludes Woodcock. However, this won't be a bargaining point during UAW contract negotiations in August and September.

One proposal that may be a contract issue this year is the plan for periodic one-week shutdowns. UAW President Walter P. Reuther suggests this as an alternative to mass layoffs or shorter work weeks. Layoffs now affect entire departments or workers who have least seniority. But one-week shutdowns would affect all workers regardless of seniority. Lost pay would be made up with supplementary unemployment benefits (SUB) and unemployment compensation.

Significance to industry: higher SUB payments, higher operating costs, and production levels dictated by the union. Others who may squawk: union members with high seniority.

Valley of reclaimed men

A highly successful salvage program is restoring to industry skilled people handicapped by a history of mental breakdown. Known as "Professionally Endorsed Patients" (PEP), they are being rehabilitated by the Sepulveda VA Hospital and citizens of the San Fernando Valley of Calif.

Full scale reclamation came when the hospital realized it wasn't enough to educate the community on mental illness. Actual personal involvement was needed. It drew up a roster of 30 influential men in the Valley—industrial relations directors and personnel executives of large plants, proprietors of small businesses, and labor leaders.

Three of these men are invited to the hospital every other week to discuss job prospects with patients nearing discharge. They are not pressured to offer jobs. Yet in discussing the job market in relation to the patients' skills, a job lead or offer is often extended. This exchange between patient and civic leaders is doubly rewarding. Patients are reassured they are not outcasts, and businessmen see for themselves that the cured are capable men.

Once patients are placed, the hospital does not surrender its medical responsibility. Employers can depend on the hospital stepping in should a man need medical aid.

Help is also given by the Rotary Club and 21 local newspapers. Rotarians are responsible for placing four patients in jobs each month. And the papers carry large display ads on PEP candidates.

VIP Rx: annual career check-up

At least half the management men looking for better employment never had it so good as in the jobs they now hold. Thrust into the highly competitive job market of today, these men would have a difficult time finding a niche, says executive counselor John F. Schmidt, Drake Personnel, Inc., Chicago.

Before jumping from the pot to the flame, he suggests that every administrator seek professional evaluation of his career status. This can be done with a job interview that places a man's ability and worth in the proper perspective. And who are better qualified than job counselors to see over both sides of the employment fence?

Schmidt envisions the day when executives will visit counselors once a year, as they now visit doctors and dentists, to evaluate their potential.

Turn the page

BREAKFAST IS SERVED...

...AND BAKER HELPED BRING IT!!!

Juice, cereal, eggs, coffee, even herrings and yogurt—whatever your breakfast preference, chances are, Baker has a hand in serving it. 9½ million tons of materials are moved each week by Baker trucks. This tonnage of food products would feed the entire United States 3 meals a day for 5½ weeks.

Baker electric trucks are balance-design engineered to every application in the food industry. Smooth electric acceleration and two-speed dynamic braking ensure complete driver control to prevent load damage—fragile foods delicately handled by *zero to maximum* metering of the hydraulic system.

Your local Baker dealer will be glad to demonstrate how Baker electric trucks ensure *speedy* delivery of crisp, fresh, *nature-flavored* foods. Or write for Baker food handling application story BAS-611.

Baker also manufactures a full line of gas and LP gas trucks for every application.

Free illustrated manual on fork truck safety-operating hints available for each of your drivers. Write Baker Industrial Trucks, 8018 Baker Avenue, Cleveland 2, Ohio.

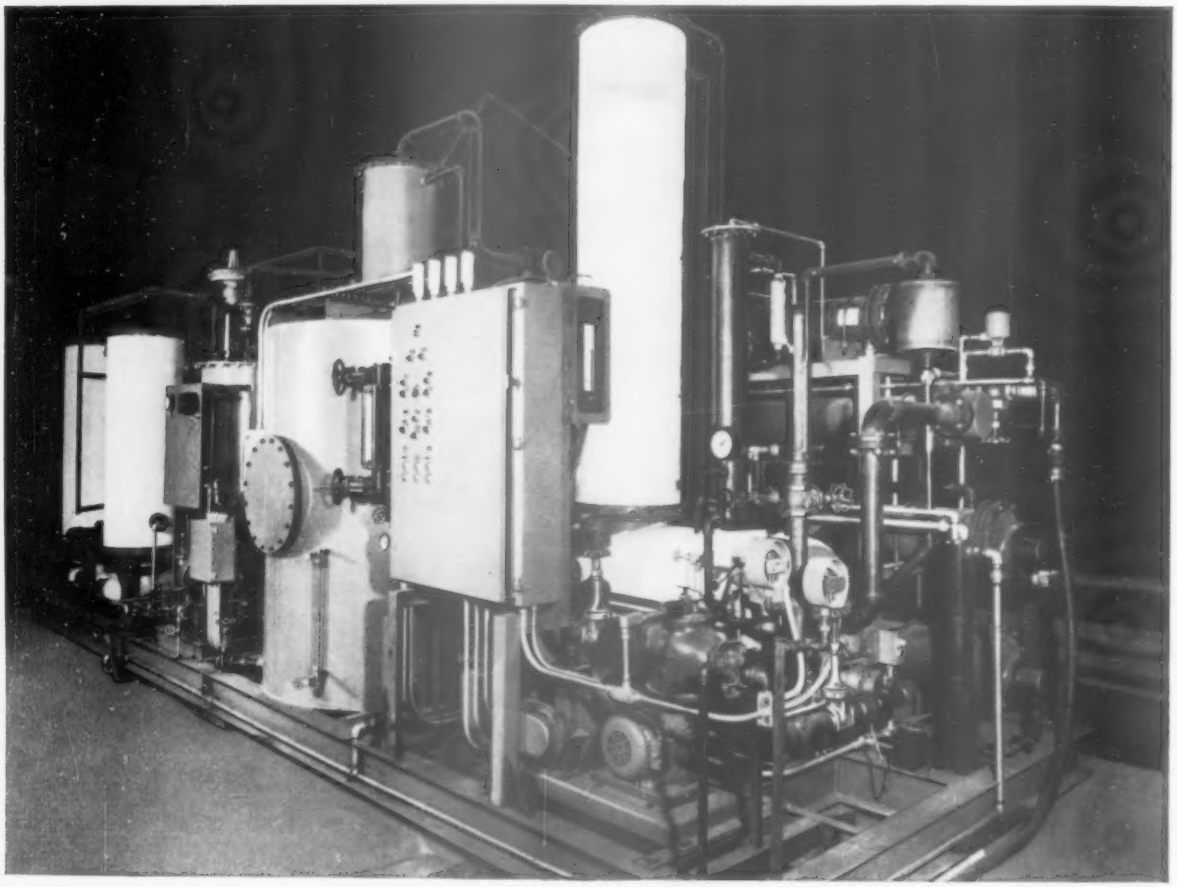
A DIVISION OF OTIS ELEVATOR COMPANY

BAKER

BAKER INDUSTRIAL TRUCKS • CLEVELAND 2, OHIO

For more facts Circle 501 on Reader Service Card

"We Won't Take Chances with Customer Confidence..



...our Atmosphere Generator Systems incorporate JENKINS VALVES"

Gas Atmospheres, Inc., Cleveland

"A reputation for reliability has made us the largest exclusive producer of packaged gas systems for industry. Care in choosing our components has helped build that reputation. We incorporate Jenkins Valves in our systems because our customers know there's nothing better to be had." Gas Atmospheres, Inc. of Cleveland and scores of other producers of industrial equipment employ Jenkins Valves to prevent trouble and costly maintenance for their customers. At the same time, they build respect for the quality of their products.

Of course, valves of less quality can be had for a little less money. But the real money-saving truth is that Jenkins Valves, so widely known for reliability and long life, COST NO MORE than any good valves. Jenkins Bros., 100 Park Avenue, New York 17.

JENKINS

MOST TRUSTED TRADEMARK IN THE VALVE WORLD

VALVES

JENKINS SINCE 1864 Jenkins Bros

Sold Through Leading Distributors Everywhere

For more facts Circle 502 on Reader Service Card

Begins on page 182

Road to retirement...

Your employees bucking retirement may be ill-prepared to face relative inactivity. A little psychological orientation to go along with that pension plan may ease the transition. To help you "graduate" successful retirees is a new magazine *Fifty Plus*. It zeroes in on pertinent problems and questions. (The magazine is available for bulk distribution.)

. . . paved with guided tours

One company we know of would make good copy for *Fifty Plus*. When employees at Eastman Kodak Company, Rochester, N. Y., "come of age," the party's just beginning. Not content with pensioning its people, the company has planned activities, such as bus tours. One bus excursion offered retirees this year—a 32-day, $500 tour—includes transportation and hotel costs for up to 108 people. Covering over 8000 miles and such places as New Orleans, San Francisco, and Chicago, it is leisurely paced. Only retired employees and their immediate families qualify.

Job auction taps latent talents

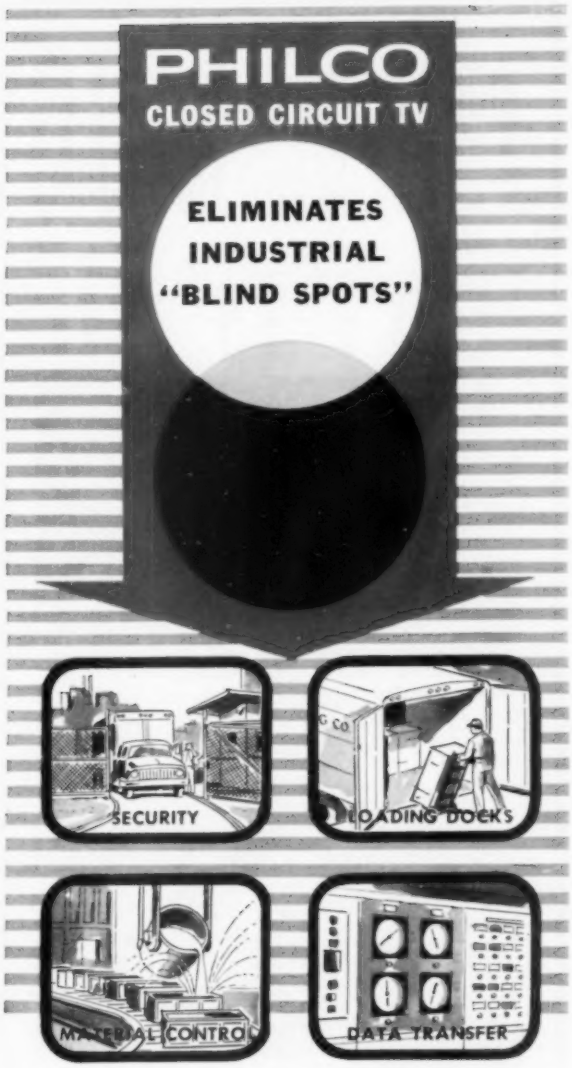
Plagued by a shortage of skilled employees to staff your new departments? One low-cost way to jump this hurdle is to canvass your current employees. You may discover a gold mine of hidden talents by allowing them to bid for new jobs.

This system is working well at Grumman Aircraft Engineering Corporation, Bethpage, N. Y. Employees are encouraged to compete for jobs in its rapidly expanding avionics departments. They fill out job survey forms listing their skills. Anyone with a strong interest in the electrical and electronics fields is urged to apply. Screening of applications is done by the personnel department, and the qualified are interviewed by managers of the new departments. Once transferred, an employee receives on-the-job training to develop skills.

Disqualified employees are notified by letter. The procedure in no way jeopardizes existing jobs.

Other benefits to the company: increased worker morale, reduced turnover, lower recruiting costs.

Turn the page



Philco closed circuit TV has proven invaluable in checking operations that are normally difficult and awkward to monitor in person . . . material flow on conveyors . . . bin levels . . . loading dock traffic . . . gate traffic . . . gauge watching. In addition, closed circuit TV can be used in employee instruction and plant communications. Philco's broad experience in CCTV guarantees putting this very flexible business tool in use to your best advantage. Fully transistorized equipment featuring Philco's "building-block" design assures ease of operation, freedom from maintenance problems and permits future expansion without costly replacement. Write today for your copy of the Philco Closed Circuit TV System Planning Guide.

Government & Industrial Group
4700 Wissahickon Ave., Philadelphia 44, Pa.
In Canada: Philco Corp. of Canada, Ltd., Don Mills, Ontario

PHILCO®
Famous for Quality the World Over

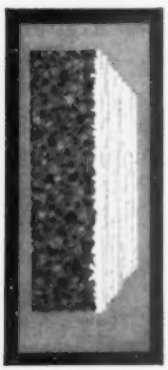
For more facts Circle 503 on Reader Service Card

plug "profit leaks" before they start!

Guard against expensive weather damage to the valuable masonry and concrete of your plant. Get three-way dividends with pioneering products of The Thoro System . . . use-tested since 1912 . . .

1. Maximum protection against water. Waterplug provides a perfect hydraulic cement seal for cracks, holes, wall-to-floor joints. Prevents dangerous masonry erosion. Applies like putty. Stops even running water—instantly. Hardens in 3 minutes—watertight.

2. Minimum costs for maintenance. Brush on Thoroseal cementitious coating and seal water out. A "must" for trouble-free masonry and concrete. Prevents erosion, corrosion, spalling. Lets walls breathe—moisture can't build up as it does behind paint film.

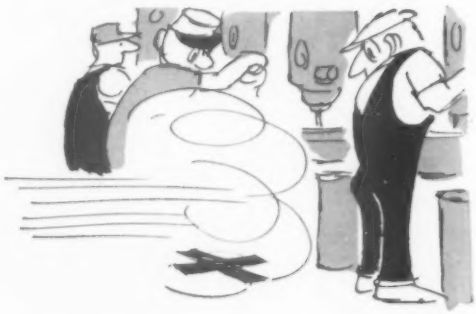


3. No more bills for water damage. Because these products are cement-based, both Waterplug and Thoroseal bond compatibly with all masonry and concrete. They actually become part of the wall—and last just as long! Designed for use above grade or below, indoors or out.

• Ask for free specification guide to all 21 time-saving, money-saving products of The Thoro System. Insure long-lived top performance in waterproofing, renovating and decorating masonry and concrete.

STANDARD DRY WALL PRODUCTS, INC.
DEPT. F-1, NEW EAGLE, PENNA.

Begins on page 182



Employee-snatchers set up school

Shanghaiing has gone the way of the buccaneers, but another kind of people-stealing has taken its place. It flourishes in the metalworking industries of Pulaski County, Ark. Employers there can't turn their backs without losing skilled men. This shortage has forced them to call a truce and to establish a night school to train qualified workers.

Classes for tool and die-making, maintenance and mechanics, are held in local high schools jointly sponsored by employers and federal and state agencies. Diplomas are given for a four-year program, certificates for a completed unit of study.

This new corps of trained men is expected to relieve the pressure for local employers and to reap added dividends by attracting new industries.

Then there's the 28-year success story of Crown-Zellerbach Corporations's papermaking school in Camas, Wash. Since it began as a mill study group in 1933, this project has graduated 571 employees. In its four-year course, beginners study logging, pulp processing, quality control. Advanced studies parallel college courses in chemistry and chemical engineering. Its high standards are recognized by two state universities which give point credits to former students.

Growth or return to normal?

Brighter employment prospects appear to be in store at least for the metalworking industries over the next 11 months. This is the conclusion drawn from a survey of 160 manufacturers' (all industries) by the National Industrial Conference Board (New York). Specifically, 35% of the metalworking companies expect an increase in factory employment; 45% see no changes in present numbers, while 20% predict cutbacks. Among the non-metal companies, those predicting an increase drop to 24%, while 57% expect to maintain the status quo, and 19% anticipate a decline.

Of the 160 companies, 80% see an increase or a return to normal level of factory employment. But it remains to be seen whether these figures reflect hoped-for future growth or a return to normal after a period of depressed activity.

FOR SAFETY YOU CAN SEE REMEMBER THE "V" FOR VISIBLE BLADES!

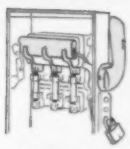
• The men who pull the switches will tell you what can happen when a switch, *believed* to be open —*isn't*. A lot of things can happen—and every one of them is bad. Personnel safety is in jeopardy. Motors can single-phase. Machinery and work can be damaged. Down-time can skyrocket.

Doesn't it make sense to insist on **V**isible **B**lade construction which gives you a road block against any of those possibilities? Doesn't it make equally good sense to insist on the safety switch which gives you that construction—plus a lot of other performance advantages? Evidently it does, because *Square D switches have never been out of first place in more than 50 years!*

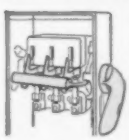
They cost no more... why settle for less?

Square D Company, Mercer Road, Lexington, Kentucky

Extra Safety with Square D's Handle Design



WHEN IT'S **UP** IT'S **ON!**



WHEN IT'S **DOWN** IT'S **OFF!**

Handle is integral part of switch, not cover. When door is opened, handle remains attached to switch. Eliminates hazard of false handle indication or defeat of padlock provision. When it's padlocked, it's locked!

SQUARE D COMPANY

wherever electricity is distributed and controlled

For more facts Circle 505 on Reader Service Card

NOPCO protects vital production

Hundreds of relays like these, which open and close hundreds of times a day to control cars, doors, signals, are inspected for worn contacts, faulty action.

NOPCO CHEMICAL COMPANY
Harrison, New Jersey
Chemicals • Plastics • Vitamin Products

Is elevator maintenance complex? Yes! As the illustrations indicate. It is an organization task requiring an unusual combination of skills. Plus a wide knowledge of parts, assemblies, functions, replacement procedures, testing and adjusting. Plus the availability of original replacement parts. Plus immediate service in emergencies.

Is OTIS elevator maintenance dependable? NOPCO has been using it since December 15, 1930 to keep seven Otis Freight Elevators and one Passenger Elevator providing vital production capacity.

OTIS ELEVATOR COMPANY • 260 ELEVENTH AVENUE • NEW YORK 1, N.Y.
OFFICES IN 297 CITIES ACROSS THE UNITED STATES AND CANADA

capacity with Otis Elevator Maintenance

Checking the floor selector that controls an elevator's operation and making any adjustments or replacements needed for top performance.

In the hoistway, on top of the car, the maintenance expert inspects the operating mechanisms and other parts vital to performance and safety.

Under the elevator, checking the action as well as condition of safeties and, as shown here, roller guides that make for smooth riding.

Moving parts requiring lubrication are oiled or greased at regular intervals with lubricants especially selected for prevailing service conditions.

Under the car platform, maintenance man inspects load-weighing switches. These switches weigh the passenger load in the car.

Lubricating an overspeed governor. All elevator safety equipment, though never used, must always be in condition to act without fail.

ENGINEERED **freight** Otis **elevators** MAINTENANCE

By PAUL A. KING, Member, New York Bar

You can track down employee thefts—but be careful

A company looking for stolen goods can search employee cars without prior permission, said one jury. But another jury might differ. Here's a way out.

NEWS TIPS

• An employee who is given a chance to work overtime cannot wait until the last moment to decide against it. A four-day disciplinary suspension for such an employee was endorsed by Arbitrator G. S. Bradley. The last-minute "no" prevented the company from rounding up others for the job.

• Government contractors now have uniform safety and health rules to guide them. A booklet on the Walsh-Healy Public Contracts Act is available from offices of the Department of Labor.

• When an employee does two tasks in a company—one task unionized, the other not—does he belong to the unionized unit? The NLRB has a simple rule for solving this problem: If the employee spends more than 50% of his time in performing tasks similar to those performed by unit employees, he is considered a member of the unit.

• To keep the curve of pension costs from rising out of sight, consider later retirement ages or larger employee contributions. People are living longer, and the longer they live, the more pension money has to be paid out. The Health Information Foundation has proof-positive that longevity is here to stay. Between 1901 and 1950, the number of years a male at age 30 could expect to spend in retirement increased by 3.6 years. A comparable increase took place among women. Now add the prospect of larger payments to meet future inflation, and you'll see why the cost curve is really ascending.

When sales drop, production can be cut back, employees can be laid off, and plant maintenance and improvement cut to the bone. But petty thievery is one profit leak that's more difficult to deal with. The hand of a crooked worker is often so much faster than the eye that you can't catch him with the goods. So desperate measures seem to be indicated—such as surprise searches of employee cars.

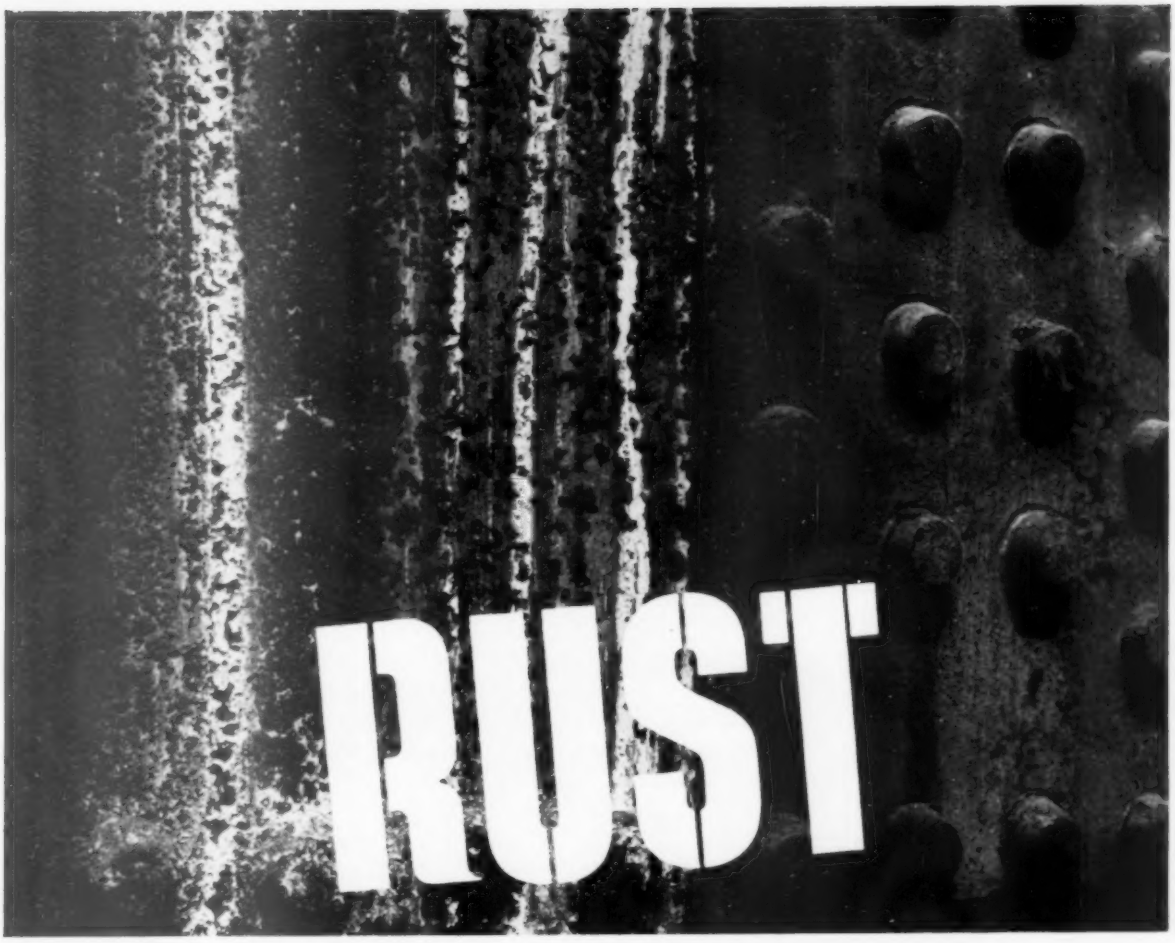
One California company, faced with a mysterious loss of tools and materials, thought that at least (and at last) it had narrowed down the culprits to the swing shift—but not to any particular workers. Early one morning extra guards were stationed at plant gates with instructions to stop and search each car before it left. This was done and nothing was found. But the search had one unexpected result—33 employees sued the company for false imprisonment and arrest. Contending that they had been detained from 10 to 25 minutes while the search went on, each sued for $3300. The judge threw 24 of the cases out of court right away. They were passengers in the cars—not owners—and had no right to sue, he declared. The jury, by a nine-to-three verdict, threw out the remaining nine cases, giving a complete victory to the company.

But just in case you'd like to try the same method, keep in mind that the difference between success and failure in a lawsuit of this kind depends as much upon the jury as upon the law. With a different jury, the company might have lost. The law on the subject, as summarized by the judge in his instructions to the jury, runs like this: A person cannot be restrained or confined against his will. But there is an exception—a person acting to protect his personal property. "A person may be reasonably detained by another in the protection of his property if such person has probable cause to believe that such person or persons are taking his property. Probable cause is defined as a suspicion founded upon circumstances sufficiently strong to warrant . . . the belief that his property was being taken."

The judge also told the jury that there can be no false imprisonment if the plaintiff consents to the confinement or restraint. He pointed out that the employees in this case may have consented to it by words or conduct at the time of the search. If they had done so without having been coerced, then there could be no false arrest. The company contended that because the employees permitted the search, they had consented to it. But a different jury might have favored the attorney for the employees, who argued that the men would have been placed in a position of potential loss of employment if they had refused to subject their cars to the search—and this could not be construed as voluntary consent.

Here's one possible way you could get around this problem of different jury interpretations: Set up a plant rule—make sure it's well publicized to all your employees—to the effect that the company reserves the right to make a reasonable number of unannounced searches of lockers, automobiles, lunch boxes, and the like (on plant premises) whenever it is confronted with the mysterious disappearance of company property.

Turn the page



WHEN THE PROBLEM CALLS FOR PAINT THE BEST ANSWER

IS INVARIABLY **Barreled Sunlight** ENGINEERED Paints

FOR A BETTER LOOKING, LONGER LASTING PAINT JOB AT LOWER COST

Rust — and ways and means of fighting it — rate special attention in any well planned preventive maintenance program. And, naturally, *paint* is a first consideration.

Before you select just "any paint" to solve this common industrial problem however, it will pay you to talk with a Barreled Sunlight Engineered Paint representative. His thorough knowledge of the rust inhibiting qualities of various heavy duty primers and finishes — as to how, when and where to apply them — help you make important savings in this critical maintenance area. **This same man** can also help you arrive at the most economical solutions to other painting problems. Call on him now for experienced consultation and a free in-plant demonstration at no obligation.

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I want help in selecting the right paint for a specific job in my plant.

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HOISTS AVAILABLE FOR EVERY LIFTING JOB

1✓ ELECTRIC HOISTS for frequent lifting with pace setting speed

2✓ AIR HOISTS to lift fast where atmosphere conditions are hazardous, corrosive, extremely hot, dirty or wet

3✓ CHAIN BLOCKS for easy lifting where the work cycle is moderate

P:B Budgit Electric Hoists

Series "700" Load Lifter Electric Hoist

ELECTRIC HOISTS

P:B Budgit® Electric Hoists. 1/8 to 2 tons. Modern push-button hoists for regular service. Portable. Two fully enclosed automatic brakes. Spotting action is fast, accurate. 1/2-ton load can be lifted at 34 FPM. Hook suspension. Trolleys available. Standard models for intermittent service — AC, DC, and 12-volt battery types — have pull cord control.

Load Lifter® Electric Hoists. 1/2 to 15 tons. For heavy-duty and production line service. Safe 24-volts at the push button. Single and 2-speed control. A ton can be lifted at 60 FPM. Two automatic brakes. Types for lug or hook suspension; also with push, hand-geared or motor-driven trolley. Hi-hook model increases length of lift.

Budgit Air Hoist

Load Lifter Air Hoist

AIR HOISTS

Budgit® Air Hoists. 1/4, 1/2 and 1 ton. Compact, lightweight hoists for regular lifting service. Link and roller chain types. Explosion proof motor. Spark and corrosion resistant link chain models. Speeds infinitely variable to 75 FPM. Pull cord control. Safety hooks standard. Rigid mount type and push trolley available.

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Tugit

Budgit Aluminum Chain Block

Budgit Army Type Chain Block

CHAIN BLOCKS

Tugit® . . . the Lever-Operated Hoist. 3/4 to 3 tons. Light. Compact. Portable. Operates easily at any angle even in close quarters. Has countless uses in every industry. Spur-geared for highest efficiency. A 42-lb. pull on the handle lifts 2 tons. Spark and corrosion resistant models.

Budgit® Chain Blocks. 1/4 to 10 tons. For production or maintenance. Combine light, strong aluminum frame with spur-geared lifting and automatic load brake. 25 lb. pull on hand chain lifts 1/4 ton. Hook suspension standard. Trolleys available. Army-type Budgit has integral trolley that can be adjusted to fit several sizes of I-beams and permits high hook lift. Ask about spark and corrosion resistant models.

SOLVE YOUR LIFTING PROBLEMS. Call your nearby Shaw-Box Distributor for practical help in selecting the best type of overhead load handling equipment — hoist or crane — for each task. Or, write us for literature.

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MAXWELL M&M MANNING & MOORE INC. TRADE MARK

OVERHEAD LOAD HANDLING EQUIPMENT

Products of

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For more facts Circle 508 on Reader Service Card

Begins on page 190

Halting arbitration

A federal court endorses a third legal method with which you can short-circuit arbitration.

After struggling hard at the bargaining table to get an arbitration clause with enough strings on it to keep the arbitrator out of management's chair in certain important areas, it's upsetting to have the union strive to get him *in* later by construing your clause provisions more broadly than you intended.

When this happens, one way to resist arbitration is to turn down the union's request to arbitrate that particular grievance. Another way is to turn up at the scheduled hearing and argue that the arbitrator doesn't have the right to hear the case. However, if the arbitrator doesn't see it your way and takes the grievance on its merits, you may end up with a broader arbitration clause than you originally bargained for, and an adverse arbitration award to boot.

In either instance, if you're serious about it, you stand a good chance of ending up in a federal court defending a Taft-Hartley Section 302 lawsuit. If you had pursued the first method, the union would ask the court for an order *compelling* you to arbitrate. If you had chosen method two, the union would ask the court for an order compelling you to live up to the award.

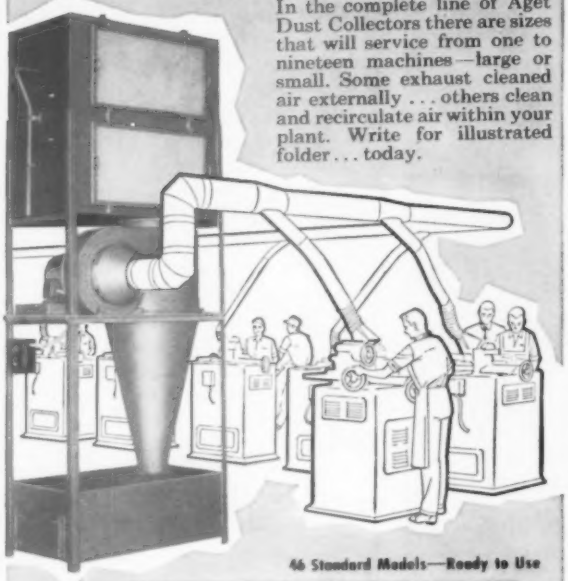
The Weyerhauser Company was well aware of these prospects when it tried to short-circuit all of this at the outset by a third method—suing for a declaratory judgment under the same Section 302. In a declaratory judgment action, a party asks a court to declare whether the party's view of the controversy is right or wrong—in this instance, whether or not Weyerhauser would have to arbitrate the grievance. Although other federal courts had ruled previously that a declaratory judgment suit of this kind could not be brought under Section 302, the court in this case—the U. S. District Court for Maine—said it could be done.

Weyerhauser claimed that the question of wages was not arbitrable under its arbitration clause. And the clause seemed to say so in so many words. But did employee

just ONE DUSTKOP STOPS DUST

heavy duty unit services up to 19 MACHINES

In the complete line of Aget Dust Collectors there are sizes that will service from one to nineteen machines—large or small. Some exhaust cleaned air externally . . . others clean and recirculate air within your plant. Write for illustrated folder . . . today.



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AGET manufacturing company
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Products of quality . . . through research

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All in one by TOTELINE

Now . . . a sturdy tote box of strong-as-steel molded fiber glass which stacks interchangeably with your present metal boxes of the popular 10 by 20 by 8-inch size.

You can benefit from the advantages of durable molded fiber glass immediately by introducing Toteline Model 538-1 into your present system. Then replace metal boxes with Toteline boxes as the metal boxes need replacement.

Toteline boxes last indefinitely without maintenance. They are immune to rust . . . you can't dent them and they never need straightening. There are no sharp edges . . . just smoothly rounded corners. Model 538-1 cleans easily with hot water.

Molded handles are a part of the integral, one-piece stacking lip. Steel wire, completely concealed within the edges of the box, adds strength and rigidity.

For further information and descriptive catalog, just cut out this coupon and clip to your letterhead. Please furnish your name and title.

NAME_____

TITLE_____

MOLDED FIBER GLASS TRAY CO., Linesville, Pa.

Chosen to Represent the U.S Reinforced Plastics Industry at the 1959 International Trade Fair in Zargreb, Yugoslavia

Begins on page 190

Cox's grievance concern wages? Cox was classified as a mobile equipment operator. But he did checking—a job that carried a higher rate of pay. Cox grieved for the higher pay. Was this or was it not a matter concerning wages?

The court didn't have to decide this question—and it didn't. The only question for the court to handle initially was whether or not it had jurisdiction to grant a declaratory judgment under Section 302, and it ruled it had the right. To other federal courts, Section 302 seemed to be confined to lawsuits for "violation of union contracts." They felt a declaratory judgment action did not involve a violation of contract. But the Maine court disagreed. It said it had jurisdiction over the suit, and left it up to Weyerhauser to carry on the litigation.

Good-faith bargaining

You can be a good-natured Joe and yield to the union on every important demand. But when can you get your back up, resist, and still not be guilty of an unfair labor practice?

Not to bargain in good faith is an unfair labor practice. Surest way of avoiding a charge of this kind is by yielding to every important union demand after a modicum of resistance. No National Labor Relations Board would dare find you guilty. But as soon as you strongly resist union demands, you run the risk of an NLRB unfair labor practice charge. Often, the risk is in direct proportion to the degree of resistance. How much resistance does it take? Few know for sure. The law theoretically provides that you are not compelled to yield—but it says you must engage in give and take. While you try to figure that one out, consider this recent case, where a U. S. Court of Appeals in Chicago attacked the Board for sitting in judgment on *what ought to be included in a union contract* rather than on whether the employer was acting in good faith. The company's negotiating was going along at a merry enough pace, considering it was to be a first contract. But the company insisted on the right to

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Now, all Spang CW Galvanized Steel Pipe carries this new marking which is your assurance of top-quality domestic steel pipe.

Look for this marking when you buy steel pipe

It spells two important advantages for you:

1. Pipe made in the United States of America must meet the high product standards set by definite technical specifications established for all pipe manufacturers. When you buy American-made steel pipe, you know you're getting a fine, standard product with good working characteristics and assured long life that will meet specified service requirements.

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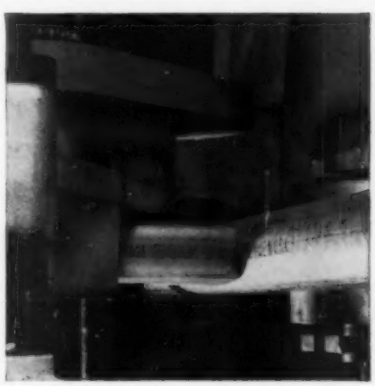
Don't take chances by making second-rate installations with questionable foreign imports. It's worth your reputation to buy Steel Pipe made in U.S.A. Look for this SPANG marking on your next pipe order. Call your nearest SPANG Distributor for service.

SPANG Steel Pipe is one of the many fine products produced by *National Supply Division, Armco Steel Corporation, 2 Gateway Center, Pittsburgh 22, Penna.*

Steel's Symbol of strength, long life, and economy



New "Made in USA" marking on Spang CW Galvanized Steel Pipe is applied after pipe has been quick-quenched following galvanizing.

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Here's a new Tropical aluminum paint with all of the advantages and *none of the disadvantages* of conventional aluminum paints!

Dri-Spray Aluminum, sprayed indoors or outdoors, provides attractive, long-lasting protection for metal, wood, concrete or plaster surfaces.

The *big extra* is that Dri-Spray Aluminum overspray dries as it falls! No need for drop cloths or other protection for floors, machines or materials inside. Outside, no danger of damage to parked cars or surrounding buildings. Dri-Spray whisks away like dust!

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Address_____

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Begins on page 190

assign work, a sound management rights clause, and (after the union went out on strike), superseniority for strike replacements.

NLRB held that, by not budging on these important issues, the company was not bargaining in good faith. There was no give and take.

Going over the company's attitude during negotiations, the court found that it had bargained in good faith.

The court held that the NLRB decision reflected the Board's own idea of what a contract should contain. Its only effect was to put pressure on the company to yield to union demands. This, said the court, was not cricket.

Employee health

Can an employee's health stand in the way of a promotion under the usual "ability" promotion clause? Add the word "qualified" and you're better off.

Just as love and marriage team up for a fine combination in song, "ability" and "qualification" team up for a good combo in the plant, when it comes to promotions. But you'll not hear unions raising their voices in praise of the association.

Commonly, promotion clauses make seniority the decisive factor when the candidates have equal ability. But what is "ability"? According to Arbitrator Harry J. Dworkin, it connotes skill, talent, and aptitude. But the term "qualified" is more inclusive and implies that the applicant can meet the conditions and requirements of the job, or that he is fit, competent, and physically able.

Kilgore, Inc., of Waterville, Ohio, thanked its lucky stars for having both words in its promotion clause. A 63-year-old arthritic material handler, with the seniority of Moses, bid on the job of burnish and tumbler operator. He was turned down flat, because of his health, as not "qualified" for the job. Kilgore claimed that the job was a wet one —the employee would be in water most of the time. His health, and the safety of fellow workers, would be jeopardized.

Turn to page 200

HERE!

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Caught in a profit squeeze? The contents of the Texaco man's briefcase can help you do something about it. Inside is Texaco's "Stop Loss" Program. It's a new cost control tool that can knock as much as 15% off your maintenance costs by showing you how to organize your lubrication. You can tack this saving directly onto profit—for an average 4% net gain. It will pay you to get the details. Write for our folder "How to Starve a Scrap Pile." **TEXACO** INC., 135 East 42nd Street, New York 17, N. Y. Dept. F-181

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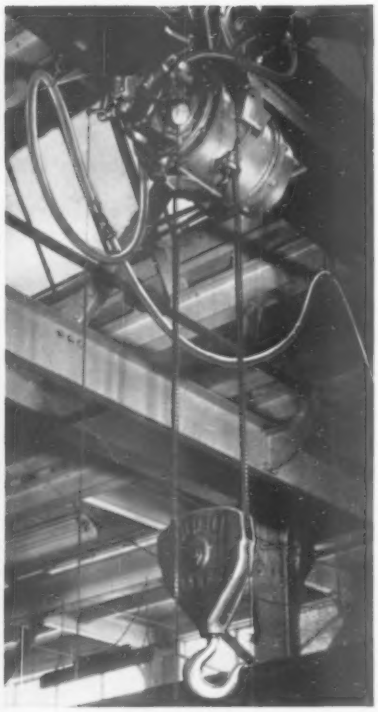

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Homoflex is the easiest handling hose made for use with air, water, other fluids and gases. Weighs less than any hose for equal pressure.

- **Super-Strong**—assures longer, trouble-free service life
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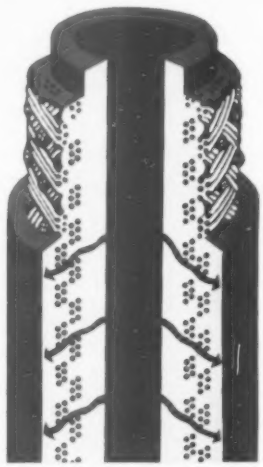
- **Homogeneous Construction**—provides inseparable tube-to-cover bond
- **Safer, Easier To Couple**—inside and outside diameters are uniform

Homoflex Hose provides savings in labor and costs wherever you use it around the plant. Let your R/M distributor show you the advantages of Homoflex . . . and other R/M hose constructions that give you "More Use per Dollar." Write for Catalog M5.



EXCLUSIVE HOMOFLEX CONSTRUCTION makes strength member and tube virtually inseparable for long, trouble-free service. Uniform inside and outside diameters permit faster, safer, easier coupling—faster, fuller flow.

RM116

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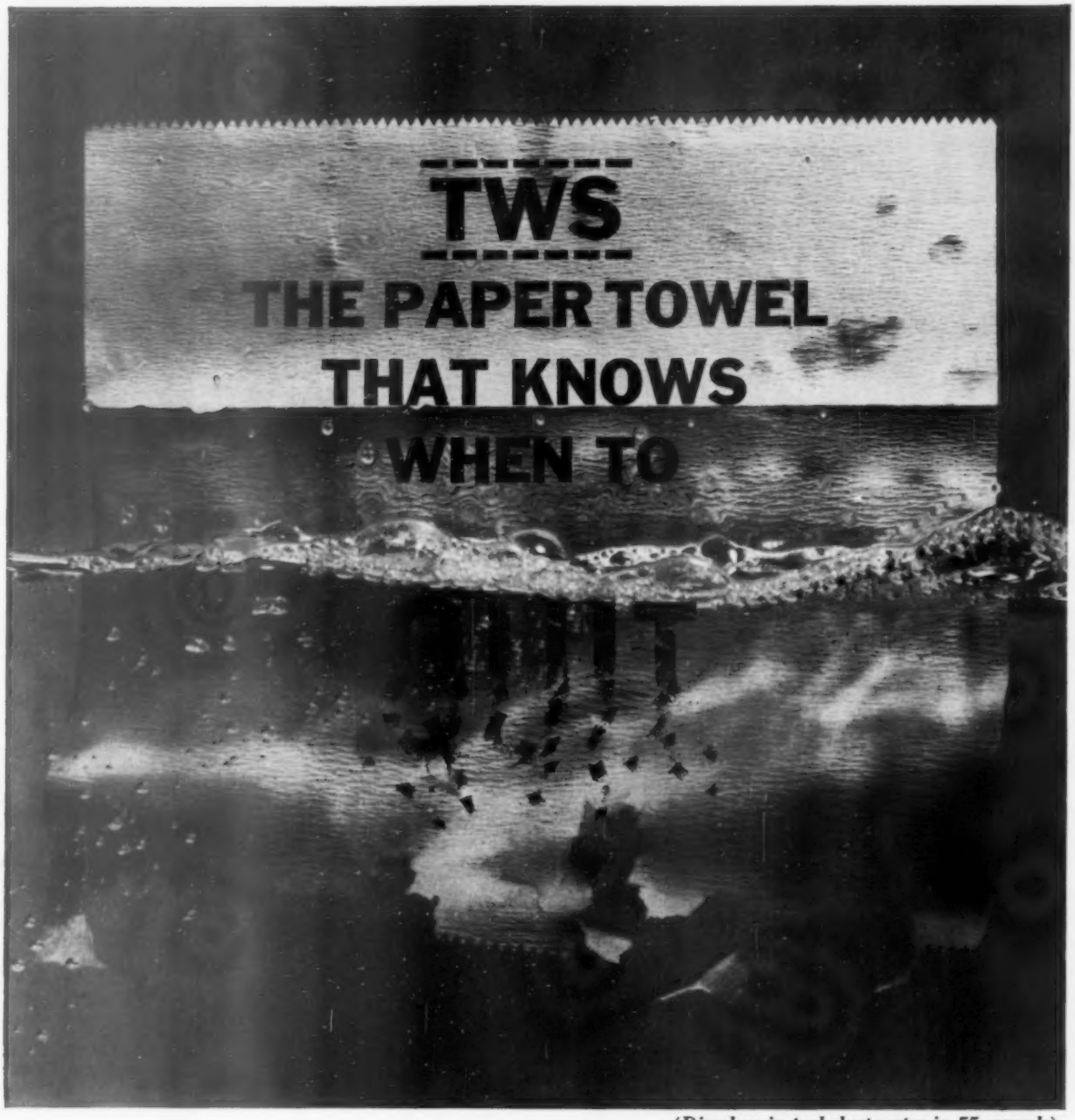

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You've got to see it to believe it — TWS Nibroc towels do their wiping job with strength . . . yet disintegrate quickly after immersion!

TWS Nibroc towels were made to order for this job — and only for this job. It's another example of Nibroc's complete line — a line designed for better service.

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Eagle high-quality oilers and cans are made in all styles and sizes, for every purpose. Efficient design and sturdy construction assure economical, lasting, dependable service.

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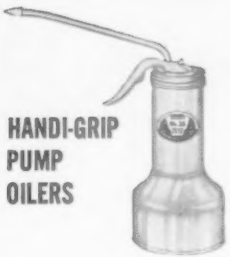
STEEL BENCH OILERS

for the mechanic, engineer, plumber, machinist, car owner . . . rigid-vertical or flexible spout . . . ⅓, ½, 1 pt. capacity.

HANDI-GRIP PUMP OILERS

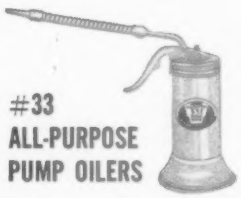


general-purpose oilers with positive-acting pump . . . leak-proof bodies, steady stance, won't tip over . . . rigid-angle or flexible spout . . . ¾, 1, 1½, 2 pt.

#66 ALL-PURPOSE PISTOL GRIP OILERS

modern-design oilers of many uses . . . one drop or a full stream of oil . . . rigid-angle or flexible spout . . . 6 oz. capacity.

#33 ALL-PURPOSE PUMP OILERS



for home workshops, farms, service stations, factories, hobbyists . . . dependable, reasonably-priced . . . rigid-angle or flexible spout .6 oz.

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keep moving parts of mobile equipment and machinery running smoothly . . . flexible, straight or angle spouts . . . ¾, 1, 2, 4 pt.

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for heavy factory use . . . flexible, rigid-vertical spouts . . . optional seal tip prevents leaking . . . ½, ¾, 1 pt.

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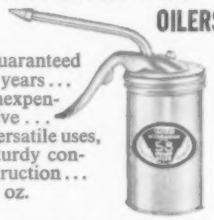

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for cleaning small parts safely, quickly . . . approved by Factory Mutual . . . seamless body . . . 1, 2 qt., 2 gal.

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for office or home, oiling fans, hinges, typewriters, sewing machines, washing machines . . . ½, 1 oz.

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storage and filling cans for mills, factories, railroads, mines, foundries . . . ½, 1, 2, 2½, 5 gal.

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approved by Underwriters Laboratories and Factory Mutual . . . safe for handling all flammable liquids . . . 1, 2 qt., 1 gal. with trigger handle; 2½, 5 gal. with free-swing handle.

GALVANIZED GASOLINE & OIL CANS

one-piece seamless dome shape . . . no top seam, no side seam . . . made from high-grade 26-gauge galvanized steel for hard use . . . 1, 2, 2½, 5 gal.

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Write for free catalog showing the Complete Eagle Line • Eagle products are also available in Canada.

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In ruling for the company, Arbitrator Dworkin laid down this principle: "In applying and construing the language governing 'ability' and 'qualification,' an employer is required to act reasonably and fairly, and to excercise sound discretion. Nevertheless, in a proper case, the physical condition and health of an employee are pertinent in determining the applicant's capacity to perform the job and whether he is qualified. In the exercise of its judgment, management is required to base its decision upon fact, as distinguished from speculation, and its judgment may not be exercised in an unreasonable or discriminatory manner. It is further apparent that each case must be appraised on an individual basis, and no rules can be pronounced which would be applicable to all situations."

From the evidence before him, Dworkin concluded that the applicant's arthritic condition had a restrictive effect upon his ability to perform all the duties which were involved. Said Dworkin: "While it is entirely possible that the grievant could perform the job in a capable and competent manner, and perhaps even without danger to himself or to others, the company's action must nevertheless be appraised in the light of the reasonable probabilities as indicated by the evidence. The issue is whether the company decided fairly and whether its decision was arrived at on the basis of the evidence, as distinguished from speculation and conjecture." He ruled that the company's judgment had been fair and was well supported.

Filling vacancies

Under the typical bidding clause, there's no obligation to fill a vacancy. To fill or not to fill is generally up to management.

The best way to short-cut arbitration, experts say (other than ignoring the arbitration clause of the contract or going to court to prevent the arbitrator from hearing the case), is through tight contract clause draftsmanship. If the words say precisely what they mean, few unions will go to arbitration. But some-

PAYLOADER® – Economy

with High Production Output

Ever wonder what happens to the "empties"?

One answer can be found in Laurens, S. C., where the Laurens Glass Works produces glass containers for beverages, food and chemicals. Their formula calls for 10% old glass (called "cullet") to be used in addition to raw materials.

This Unusual Situation involves moving 60 to 70 tons of broken bottles during an 8-hour day — first unloading incoming cullet, then stockpiling and later reclaiming it to feed the crusher. For these operations, they recently purchased a Model H-25 PAYLOADER that handles up to 1900-lbs. of cullet per bucket load.

Foreman Henry L. Finley Says: "I've used PAYLOADER tractor-shovels in this department for 14 years with dependable, high production output and low downtime. Now, our new H-25 has replaced two older HA's, doing the same operation. Its power-shift transmission has less wheel spin which insures faster loading and considerable less tire wear. Its roll-back bucket gives less spillage for a much cleaner work floor condition."

PAYLOADER Performance — The many exclusive features on the Model H-25 makes it the most adaptable and economical material handling unit imaginable. It thrives on **big production** all day long, thanks to its 2,500-lb. operating capacity, 6-ft. turning radius, complete power-shift transmission, power-steering, power-transfer differential and fast, hydraulic bucket control. In addition, **reliable performance** is assured through its closed, pressure-controlled hydraulic system plus filters and seals throughout the machine that protect against dust, moisture and corrosion damage.

You Can Increase Output in your bulk handling operations, too, by talking "PAYLOADER" with a Hough Distributor. There are 8 PAYLOADER sizes (20 models) to fit every handling need. Contact your distributor today or write for more facts.

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4-A-2

Begins on page 190

times, no matter how well drawn the clause, a union with a penchant to please rank and filers will do their darndest to see to it that labor relations policy is made not by management but by an arbitrator.

A Pennsylvania brewer thought that nothing could be clearer than his bidding clause, which ran: "If a vacancy occurs in the job of chauffeur, the helper with the greatest seniority shall be promoted, if capable." To the company, it meant that if a chauffeur should leave, or be transferred, it would be up to management to fill his spot—if it chose. It didn't have to fill the vacancy, but if it decided to, it would have to look at the seniority of helpers. As the union saw it, the minute a chauffeur left his spot, a vacancy was created which *had* to be filled by the company. It had no choice. Arbitrator Harry J. Dworkin disagreed. To fill or not to fill is within the discretion of management, he said.

One way management could make doubly sure of the intent of the clause in such a case would be to add a phrase: "Nothing herein shall be interpreted as requiring the company to fill a vacancy."

Free speech

An employer can't use tape recordings of speeches to employees as evidence, says the NLRB.

In the heat of a union organizing campaign, employers may say things to their employees which the National Labor Relations Board may consider to be an unfair labor practice—unfair enough to upset a representative election, even one the employer has won. In view of this, many speech-making employers stick to a prepared script. The president of California Lingerie, Inc., did more than that: He made a tape recording of his speech to employees. And was he surprised to find that, at an unfair labor practice hearing, the NLRB *would not admit it* as evidence of what he said. Ruled the Board: "We are reluctant to accept Dictaphone tapes and/or transcriptions thereto as being accurate, because of the mechanical possibility that they may be altered."

DON'T EVER USE MOUTH-TO-MOUTH RESUSCITATION AGAIN*

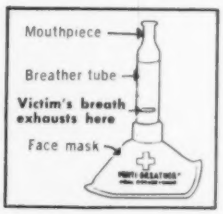
It's criminal to teach mouth-to-mouth resuscitation in a first aid class with an attractive victim when everybody knows a real victim is likely to be so repulsive the rescuer "freezes" and can't act.

It's criminal to let anyone use mouth-to-mouth resuscitation and expose themselves to polio, meningitis, mumps or worse!

Today these risks are entirely unnecessary. With Venti-Breather anyone, providing they study the instructions, can give mouth-to-mask resuscitation even to a cold, clammy, repulsive victim without getting closer than 6 inches to his face—without inhaling his breath. Nothing to put in victim's throat, no gagging, no vomiting. No loss of precious minutes providing Venti-Breather is at hand.

Study the pictures below. Ask your supply salesman to show you the Venti-Breather. Literally dozens of industrial plants have bought Venti-Breathers, placing them at strategic locations throughout their plants. Be prepared. Try out this sensational mouth-to-mask and you'll never use outdated mouth-to-mouth resuscitation again.* Only $5.98 for Wall-Pak, Pocket-Pak or Training Model. Venti-Breather Prod., Inc. 725 15th St. N.W., Washington 5, D.C.

** Unless You Haven't Got A Venti-Breather*



For more facts Circle 520 on Reader Service Card

Partners in the Plant....

VISE-GRIP®

Does More Jobs Easier Than Any Other Tool!

Adjusts quickly to any size work, then locks on with a nonslip ton grip. Releases with fingertip pressure. You name the production job, Vise-Grip does it—as a pliers, adjustable wrench, locking wrench, end wrench, pipe wrench, wire cutter, hand vise or clamp. This is the one tool all industry needs. *Only* $2.15-$2.95.

PETERSEN MFG. COMPANY • DEPT. F-4, DE WITT, NEBRASKA

For more facts Circle 521 on Reader Service Card

Circle 522 on Reader Service Card for items on next page

"Forgot we even had that one"

That's a typical reaction of Gardner-Denver air compressor owners when they check on compressed air costs. But this heavy-duty compressor never forgets. It keeps delivering dependable air power—on a continuous basis. Write for Bulletin HAC-40.

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd.,
14 Curity Ave., Toronto 16, Ontario

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER-DENVER

GARDNER-DENVER Since 1859

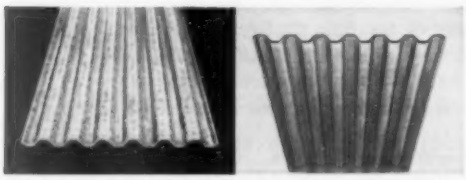
TENSILFORM® BY WHEELING

Tensilform complies fully with American Iron and Steel Institute's Design Manual for Light Gauge Structural Shapes (1960 Edition).

Big, wide, wonderful open space!

There's a light, airy look about buildings that have roofs of Tensilform and lightweight aggregate fill.

That's because exceptionally strong Wheeling Tensilform permits fewer, lighter roof supports . . . and Wheeling's *all-new* design provides excellent lateral stability for all types of structures.



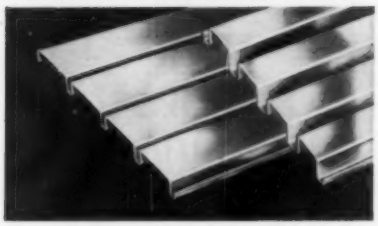
USE TENSILFORM AS A CEILING, TOO! The long, angular lines of Tensilform make nearly any building look more expansive.

More than that, galvanized Wheeling Tensilform, combined with either conventional or light aggregate concrete, gives you roofs with:

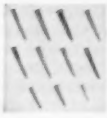
- Excellent "U" factors at low initial costs.
- Lower fire and extended coverage ratings.
- Earlier occupancy because shoring isn't needed . . . and Tensilform can be installed even in freezing weather.
- Cleaner construction because precision-formed Tensilform cuts cement seepage at *both* lateral and end joints.

Get the full story on Wheeling Tensilform for roof and floor slabs from our catalog in Sweet's. Or write to the Wheeling Corrugating Company, Wheeling, W. Va.

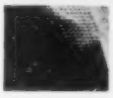
WHEELING PRODUCTS INCLUDE:



STEEL ROOF DECK — For use with conventional built-up roofs. Like Tensilform, Wheeling Steel Roof Deck goes on fast in all weather . . . can be field-painted the color you specify. Made of Cop-R-Loy® steel for extra-long life.



LABELLE CUT FLOORING NAILS — Unexcelled for laying tight, quiet hardwood floors because the nail corners cut wood fibers . . . make them work like fish-hook barbs.



METAL LATH — A complete line of expanded metal laths and lath accessories for all plaster applications.

EXPANDED METAL — Stronger than the steel from which it's made, Wheeling Expanded Metal is widely used as a decorative material . . . and wherever free passage of light, air, heat or liquids is required.

WHEELING CORRUGATING COMPANY · IT'S WHEELING STEEL!

Immediate delivery on all stocked items from these warehouses: *Boston, Buffalo, Chicago, Columbus, Detroit, Kansas City, Louisville, Minneapolis, New York, Philadelphia, Richmond, St. Louis.* Sales Offices: *Atlanta, Houston, New Orleans.*

"LUBRIPLATE LUBRICATION IS AVAILABLE AT OUR DEALERS"

Says—
STUDEBAKER-PACKARD CORP.
Builder of the famous "LARK"

The Studebaker-Packard Corporation, builder of the LARK, express their satisfaction of LUBRIPLATE Lubricants by having these fine lubricants packaged under the Studebaker-Packard trademark and made available for use by the service departments of their dealers.

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE LUBRICANTS WILL IMPOVE ITS OPERATION AND REDUCE MAINTENANCE

Besides Studebaker-Packard Dealer distribution, there are LUBRIPLATE dealers from coast to coast. See your classified telephone directory for name of nearest LUBRIPLATE distributor. Send for free "Lubriplate Data Book". Write today.

LUBRIPLATE DIVISION
Fiske Brothers Refining Co.
Newark 5, N. J. Toledo 5, Ohio

206 Circle 524 on Reader Service Card

FACTORY CATALOG NEWS

For more about these items, circle numbers on Reader Service Card next to back cover.

PRODUCTION

1—Comparators. Catalog No. 6013 is a comprehensive 60-pager that covers optical comparators and universal measuring machines. One section gives a step-by-step demonstration of how basic measuring is done. *Jones & Lamson Machine Co.*

2—Barrel finishing. This revised pocket-size 96-page booklet discusses abrasive barrel-finishing media. Describes processes, recommends shapes and sizes for various applications. Includes case histories, conversion table, glossary of terms, photos. *Norton Co.*

3—Belt grinder. Catalog 100, "Loungway Rise and Fall Abrasive Belt Grinder" (8 pages), gives details of machine that replaces many hand-grinding operations. Reduces number of rejects, increases production. *Eastern Machine Screw Corp.*

4—Weldment parts. Catalog No. 611 (8 pages) gives details of product called Spherical Corner Transition. Its purpose? Fits into the inside corners of rectangular tanks, bins, other containers. Size: 3 in. *Conner Steel Products.*

5—Toolroom grinding. Explanatory data are given in 32-page booklet covering grinding and sharpening of wheels. Illustrations show set-ups for all kinds of grinding operations; special wheel recommendations for each. *Macklin Co.*

6—Jig borers. Machines that can be equipped with tape control in three axes are described in 20-pager (Form 560). These borers feature pushbutton controls, harness-type wiring, fingertip dialing, etc. *Fosdick Machine Tool Co.*

7—Spindle chuckers. Information on work pieces, tooling, machine functions, set-up and methods is presented in 32-page booklet (Form 5803). Includes helpful application ideas for all "AC" machine users. Photos. *The Warner & Swasey Co.*

8—Rotoblast barrels. Five heavy-duty barrels with capacities from 15 to 102 cu.ft. are covered in Bulletin No. 705 (16 pages). Illustrates features that make Rotoblast the powerful blast-cleaning process it is. *Pangborn Corp.*

9—Saws, tools. Here's a catalog-handbook (20 pages) that lists complete line of carbide-tipped blades and tools. Selector shows what blade to use for which type of material and cutting condition. *Victory Carbide Saw & Tool Co., Inc.*

10—Metalworking tools. Here's a 24-pager (1161CJ) on tools, including new Speedi-Spacer and B Series clamps. Whatever tool you need you'll find in this guide, "10 Ways to Make Setups Easier, Quicker." *Universal Vise & Tool Co.*

11—Clean-room service. This 4-pager tells about program for providing controlled environments where product reliability is a must. Explains advantages of purchasing clean rooms; sketch shows small room. *Controlled Environment, Inc.*

MECHANICAL

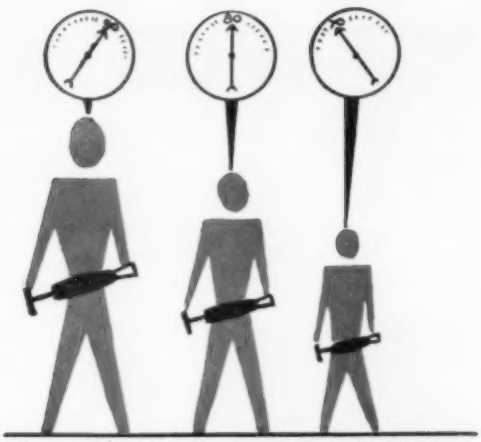
12—Speed drive. Bulletin 2900 (6 pages) outlines adjustable drives for applications in the ¾- to 2500-hp. range. Describes four types of packaged drives, and gives ratings, speeds, associated controls, etc. *The Louis Allis Co.*

13—TW Drive. Features of this new drive are discussed in 8-page illustrated bulletin (No. 1001). Drive provides quiet, low-cost agitation in open or closed chemical vessels; comes with either seal or stuffing box. *The Pfaudler Co.*

14—Tensioners, idlers. Here's a 4-pager about Series A (shaft-mounted) and S (base-mounted) tensioners. Gives dimensional tables for bronze bushed idler pulleys and sprockets; installation diagrams. *Brewer Machine & Gear Co.*

Turn the page

If your tools require a pressure of 90 psi, your production efficiency drops 13½% if pressure falls to 80 psi, and drops 27% if pressure goes down to 70 psig.



how low air pressure ***shrinks your manpower!***

EXPERIENCED PRODUCTION MEN know that the biggest thief of production with air tools and air operated equipment is low air pressure at the tool when operating under load. This costly condition, which can exist even if air systems are new, requires constant checking to maintain correct pressure at the tools.

LOW TOOL PRESSURE can result from inadequate piping, leakage or an overworked compressor . . . To find out quickly if you are getting full production from your air tools and equipment, ask today for a brief survey by a qualified I-R AIRengineer. You'll find one at your nearest Ingersoll-Rand Branch Office or authorized I-R distributor.

Ingersoll-Rand
11 Broadway, New York 4, N. Y.

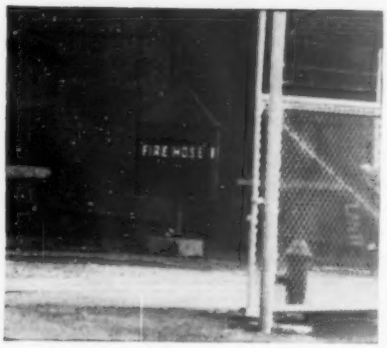
Ingersoll-Rand Type 30
Air-Cooled Air Compressor
½ through 20 hp

114A3

Guard your plant with

"SYN-FLEX"

U.S. PAT. NO. 2392967



Lightweight

NEOPRENE COVERED

FIRE HOSE

Check these advantages...

1 —Basic lightweight "FIRE-FLEX" construction . . . 50' coil of 2" weighs only 35½ lbs., with diameter of only 22". Compare *that* with regular rubber-covered fire hose!

2 —Black "Synplastic"® cover is highly resistant to abrasion and action of chemicals, oils, grease.

3 —Does not require drying after use.

4 —Extremely flexible . . . easy to handle.

5 —ECONOMICAL because of its long service life.

300 LB. TEST

"SYNFLEX" is a modern fire hose especially designed for the Chemical, Petroleum and allied industries.

"If it's GOODALL, it MUST be Good!"

Contact Our Nearest Branch, or Send for New Catalog FH-59

Manufacturers of Mechanical Rubber Products—Since 1870

Standard of Quality HOSE · BELTING · FOOTWEAR CLOTHING · EXPANSION JOINTS · PACKINGS · LINERS, ETC.

GOODALL *Rubber Company*

GENERAL OFFICES, MILLS and EXPORT DIVISION, TRENTON, N. J.
Branches and Distributors Throughout the United States and in Canada

FACTORY / CATALOG NEWS

Begins on page 206

For more about these items, circle item numbers on Reader Service Card next to back cover.

15—Positioners. This 10-pager describes electrical/mechanical positioners for many types of devices for regulating machine tools, valves, floats, hoppers, saws, throttles, etc. Flow action photos; charts. *Hanna Engineering Works.*

16—Couplings. Bulletin 4100 (24 pages) presents data on torsionally resilient Steelflex couplings. Explains how grid-groove design protects connected machines against shock and vibration. Handy index; dimensional tables. *The Falk Corp.*

MATERIAL HANDLING

17—Fork-lift truck. Circular 32B (6 pages) describes Sitdrive truck that comes in 30 models with capacities to 4000 lb. Explains the Inchomatic drive control that allows exact inching and load spotting. *Lewis-Shepard Products Inc.*

18—Scales. Two catalogs: No. 481B (4 pages) illustrates special features of 4-section pipe lever ball-bearing railroad-track scales. No. 685B (14 pages) covers 4-section straight level railroad-track scales. *The Howe Scale Co.*

19—Hold-back clutch. Here's a 12-pager that tells about clutches designed to prevent runback or reverse travel of inclined conveyors, bucket elevators, and related handling equipment. *Formsprag Co.*

20—Palletainers. Brochure S-61 (4 pages) contains condensed specifications, construction details on various types of Palletainers and the new Junior Palletainers for small parts handling, storage, transport. *Union Steel Products Co.*

21—Pallets. This 4-pager describes expendable pallets said to be capable of every palletizing task in warehousing, etc. Econ-O-Pallets come knocked down, can be assembled at point of use in less than minute. *Materials, Inc.*

Turn the page

By Using the Weber Touch-Stencil System

All Shipping Cartons at Gillette are Addressed by One Man!

Great savings result. Savings in manpower vitally needed in more productive positions. Savings in time, particularly during peak shipping periods, enabling customers throughout the United States to receive faster and more efficient service. Savings in costly addressing errors.

Stencils and invoice forms prepared together on automatic tab equipment.

At Gillette Safety Razor Company, a Weber label-size stencil is pre-tabbed over the addressee section on Gillette's customer invoice forms. The invoices, with stencils attached, are then fed through the tabulating machine which cuts the stencil and addresses the invoice *in one operation*. The Tab-On stencil and invoice are then sent to the Shipping Department, where the stencil is quickly attached to a sturdy Web-O-Print handprinter — ready to address an indefinite number of cartons just by touching them.

No order is completed until it's been shipped, and nothing gets shipped until it's been addressed. Whatever paperwork method or material handling procedure you now use, a Weber System can be tailored to your requirements.

Find out more about how you can save time and money in shipping the same as Gillette has. Send coupon for your free copy of our 16-page brochure which outlines the 7 famous Weber marking and addressing systems now being used by the leaders in every industry.

Weber

MARKING SYSTEMS

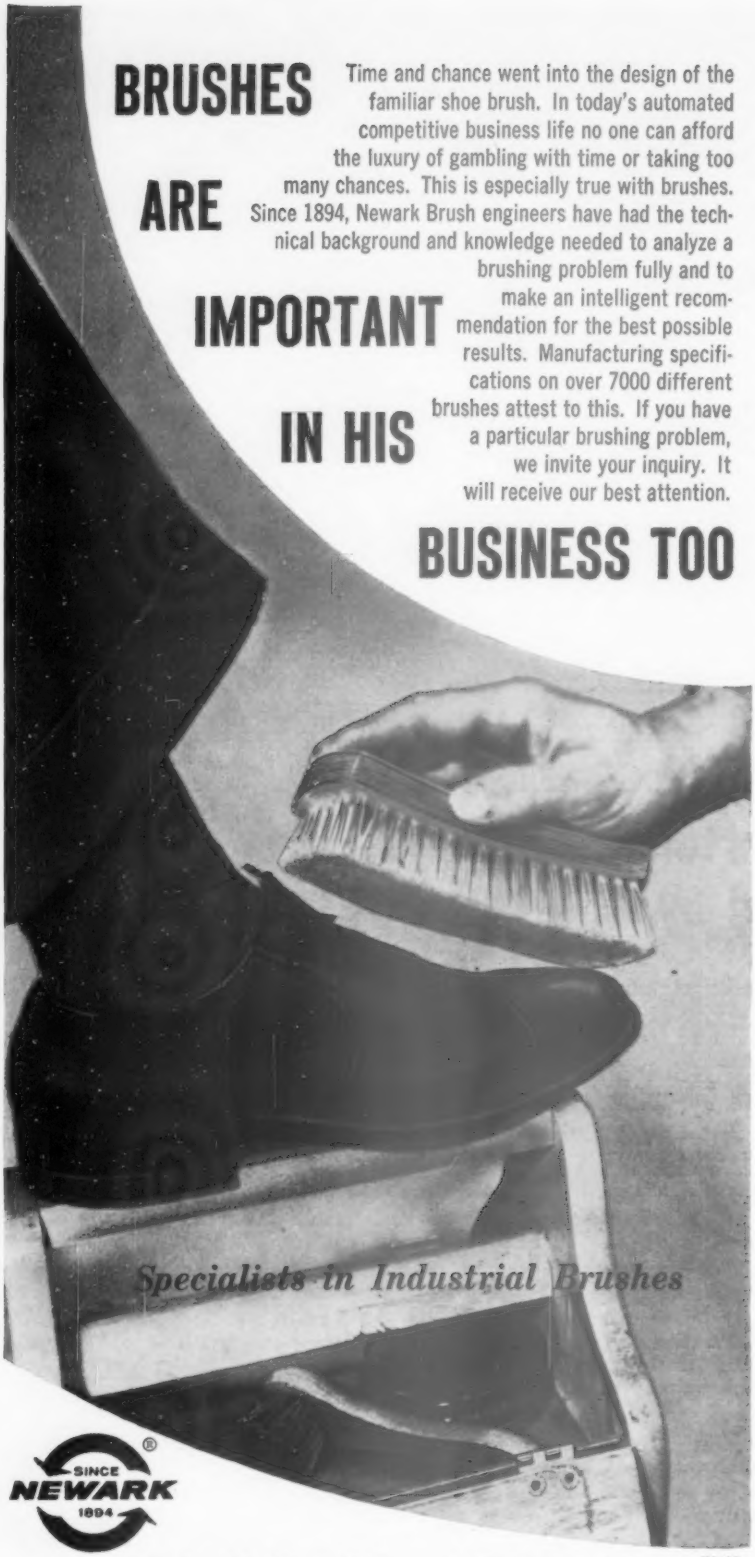
Division of Weber Addressing Machine Co., Inc. Mount Prospect, Illinois

Creators of Systems and Equipment for Addressing and Marking

NEW 16-PAGE SYSTEMS BOOKLET
No charge.
Just mail the coupon.

WEBER MARKING SYSTEMS
Dept. 17-D
Mount Prospect, Illinois

Name_____
Position_____
Company_____
Address_____
City_____ Zone____ State_____


BRUSHES ARE IMPORTANT IN HIS BUSINESS TOO
Time and chance went into the design of the familiar shoe brush. In today's automated competitive business life no one can afford the luxury of gambling with time or taking too many chances. This is especially true with brushes. Since 1894, Newark Brush engineers have had the technical background and knowledge needed to analyze a brushing problem fully and to make an intelligent recommendation for the best possible results. Manufacturing specifications on over 7000 different brushes attest to this. If you have a particular brushing problem, we invite your inquiry. It will receive our best attention.
Specialists in Industrial Brushes
SINCE NEWARK 1894
59-46

Leadership Proved Through Performance!

NEWARK BRUSH COMPANY

260 MICHIGAN AVE., KENILWORTH, N. J.

For more facts Circle 528 on Reader Service Card

FACTORY / CATALOG NEWS

Begins on page 206

For more about these items, circle item numbers on Reader Service Card next to back cover.

22—Wire rope. "Correct Wire Rope Contractors' Equipment" is an 8-page bulletin (No. 5702-R). It includes details of rope constructions, applications, bucket and lubrication information, diagrams, photos. *Macwhyte Wire Rope Co.*

23—Wire baskets. Specifications for wire, and illustrations of standard and special woven wire baskets are given in 8-pager (B-10). Come in many sizes and shapes for degreasing, dipping, heat treating, etc. *Newark Wire Cloth Co.*

24—Conveying systems. "How to Plan and Install Your Own Conveying System" is a handy 20-page guide (No. 500). Describes power belt and gravity conveyors, illustrates V types and symbols. Selection checklist. *Conveyor Systems.*

25—Fork trucks. Bulletin SS-2045 (8 pages) describes two trucks with capacities of 60,000 and 70,000 lb. at 48-in. load centers. Designed for heavy lifting work. Data includes speeds, grades, brakes, hydraulic systems. *Clark Equipment Co.*

MAINTENANCE

26—Elevator care. This 24-pager (A-418) presents a preventive maintenance program to protect elevators. Tells how service prevents trouble before it starts; photos show efficient "pit to penthouse" procedure. *Otis Elevator Co.*

27—Signaling equipment. Catalog BSM describes a variety of electric signaling and hardware products. The signaling, communication and alarm systems are listed separately. *Auth Electric Co., Inc.*

28—Safety gratings. Safety Handbook No. 75 (32 pages) describes types and sizes of Firm-Grip gratings, stair treads, work platforms, ramps, and the like. The comprehensive manual includes photos, diagrams. *Bustin Steel Products, Inc.*

Turn the page

Slippery flooring problem solved by St. Regis Paper Company's Bucksport, Maine, plant because M-S-A® Dura-Grip stays down, stays safe

"We haven't had a slip or fall report since we applied M-S-A Dura-Grip in August 1959."

That's the user experience of Howard C. Brooks, Safety Director of St. Regis Paper Company's Printing Paper Division.

Danger from water, often mixed with oil, is a slippery hazard in most paper mills. But St. Regis solved this surfacing problem by applying M-S-A Dura-Grip to 1,400 square feet of walkways.

Applications proved durable in spite of heavy employee and vehicular traffic, and the punishing side effects of frequent hosings with steam-detergents. *You can realize the same results in your plant.*

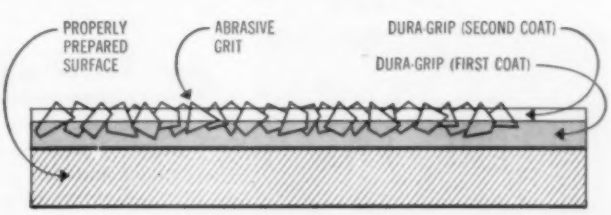
On properly prepared surfaces, this anti-slip compound will wear and wear. And it won't break down, flake off, chip, peel or disintegrate. No worry about premature resurfacing.

Use it on metal, concrete, wood or marble. Inside or outside. Any place foot traffic or wheel traffic could conceivably slip, slide, spin or skid.

Anyone can apply it. Cures fast. Neat and attractive, Dura-Grip is now available in four colors: Black, Gray, Yellow and Red.

For free bulletin, write MSA, or check with the MSA representative. *Sample of applied material on request!*

MINE SAFETY APPLIANCES COMPANY
Pittsburgh 8, Pennsylvania



This is the Dura-Grip sandwich. Edges, sides and corners of the tiny particles, impregnated in the resin bonding coat, protrude enough to form an absolutely slip-proof surface. Second locking coat permanentizes the grits.

For more facts Circle 529 on Reader Service Card

SERVICE

More than 125 Palmetto distributors make it easy for you to give pumps, presses, and other equipment the best of packing care! Wherever you are, one of the network of Palmetto distributors is close at hand with complete service.

His Palmetto-trained specialists provide on-the-spot advice on the right packings to use . . . his full stocks insure an immediate supply of whatever is required. You avoid large inventories, eliminate downtime while waiting for shipments from a distant point.

FOR EXAMPLE

In service with cold water, slurries, sewage, calcium brine: Nothing else gives the durable yet score-free service of Palmetto Palco®, cotton self-lubricating packing. Your Palmetto distributor has a supply for your use—today.

Write or phone now for catalog SLP, describing self-lubricating packings, and for the name of your nearest Palmetto distributor.

PALMETTO PACKINGS

GREENE, TWEED & CO.

OUR 99TH YEAR

NORTH WALES, PA.

212 **Circle 530 on Reader Service Card**

FACTORY / CATALOG NEWS

Begins on page 206

For more about these items, circle item numbers on Reader Service Card next to back cover.

29—Steam cleaners. Here's an 8-pager (Form SC-GC) with specifications and application information for steam cleaners from the budget-priced HandyDandy to the large-volume HPC cleaning systems. Lists accessories. *Malsbary Mfg. Co.*

30—Link V-belting. This 4-pager tells how you can reduce downtime, cut costs with versatile V-belting. For replacement needs the right length is always available; easy to install, smooth running. *Fort Worth Steel & Machinery Co.*

31—Tool chests, stands. Many models of chests and stands are described in this illustrated 8-page catalog. Products have been "designed by mechanics for mechanics." *Metal Box & Cabinet Corp.*

32—Signs for safety. Catalog 19 (52 pages) presents signs that cover just about every situation—"caution," "eye safety," "health-sanitation," "traffic" warnings, "danger," "fire prevention," "first aid." *Ready Made Sign Co., Inc.*

BUILDING

33—Grid system. Here's a 4-page revised booklet (2e/Gri) that describes reinforced concrete construction utilizing one-piece lightweight steel grid domes. Includes safe-load tables, ceiling, floor layouts. *Grid Flat Slab Corp.*

34—Pole buildings. If you need more floor space per building dollar invested, you'll want Bulletin W-388 (4 pages). Has information on expandable clear-span buildings, using principles of pole and truss design. *Koppers Co., Inc.*

35—Fluorescent ballasts. This 32-pager features dual listing by lamp type and catalog number of company's diversified line of ballasts for indoor and outdoor applications. Includes wiring diagram, lead lengths. *Universal Mfg. Corp.*

Turn the page

how to pull the wool

The sheep wouldn't do it—so Barneby-Cheney pulled it off. Carbon wool—an elemental carbon fiber which adsorbs odors. Its great strength, high temperature resistance, chemical inertness and pliability make it a natural for air filtering, insulation and adsorptive cloth. Available in many fiber sizes. Stop in for a fitting.

how to save the day

Evil days befall when contaminated air robs your employees of efficiency or your neighbors of neighborliness. This has a way of turning balance sheet ink from black to red. Whether you save your air and dump the contaminant—or dump your air and save the contaminant, an activated charcoal system will save the day. It's doing it now in many plants.

how to sweeten a furnace

Your furnace shows a shocking lack of discrimination. It heats anything you give it through the return air ducts. Many smart furnace and air conditioner users slip an inexpensive activated charcoal filter into the system behind the dust filter. It adsorbs all odors as sweet as you please.

activated charcoal

Activated charcoal acts as a molecular sponge, purifies air, gases, liquids—recovers solvents—removes odors and impurities. Write for Bulletin T-362. Barneby-Cheney, Columbus 19, Ohio.

Barnebey Cheney

Circle 531 on Reader Service Card

NEW WAY TO TEST YOUR PRODUCTIVITY

Now, Rotor Field Engineers can come into your plant and give you a far more complete testing of your air grinder productivity.

The new Rotor Portable Tool Comparator shown in use, measures efficiency under load conditions. Hence, it permits a far more practical appraisal of your productivity. This new method gives factual data for decision to repair or replace existing tools and whether new tools will pay for themselves.

Your Rotor Field Engineer will bring a Comparator Kit into your shop for a productivity test of your air grinders, or show you how to do this yourself. Write for your "Portable Tool Productivity Analysis". There is no obligation. The Rotor Tool Company, 26300 Lakeland Avenue, Cleveland 32, Ohio.

Floyd L. Paschke (right), Sales Manager, Rotor Tool Company, demonstrating use of the Comparator.

Is your grinding productivity up to PAR?

ROTOR TOOLS

The Rotor Tool Company · Cleveland, Ohio

SUBSIDIARY OF THE COOPER-BESSEMER CORPORATION

ROTOR AIR TOOLS: Assembly Tools • Drills • Small Wheel Grinders Straight Grinders • Vertical Grinders • Scalers • Chippers • Rammers Special Tools • Air Motors

ROTOR HIGH-CYCLE ELECTRIC TOOLS: Grinders • Polishers • Sanders

For more facts Circle 532 on Reader Service Card

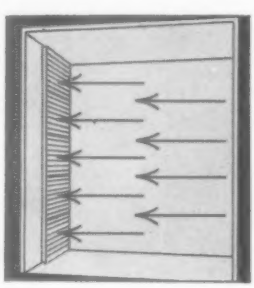
the CLOSED door that's always OPEN

"Air Curtain" in use at Merchants Refrigerating Company, Vinita Park, Mo. It separates −10°F freezer area from shipping dock.

The American Air Curtain is a "barrier" made of moving air. It lets people and products move freely...yet it keeps out cold, heat, wind, rain, or snow—completely. Smoke, dust, and insects can't penetrate it.

Use it for a loading platform entry. Use it for confining paint fumes, heat from bakery ovens or die-casting machines, or cold storage spaces.

Chances are there are a dozen good uses in your plant for an American Air Curtain. Write us for complete details.



In this case, air travels horizontally to form a barrier between rooms of different temperatures.

AMERICAN AIR CURTAIN
A DIVISION OF UNIVERSAL MATCH CORPORATION
ST. LOUIS 35, MO. • NEW YORK 18, N.Y.

FACTORY / CATALOG NEWS

Begins on page 206

For more about these items, circle item numbers on Reader Service Card next to back cover.

36—Noiseguard panels. Bulletin K16D (6 pages) covers sound-absorption characteristics of panels, barriers, enclosures, etc. Construction data; diagrams of wall-and-ceiling, wall-and-corner connections. *The Korfund Co., Inc.*

37—Roof decks. Case histories show how five different types of buildings used full fire-resistive roof construction—and saved money. Booklet L22 (16 pages) has details about insurance costs, etc. *The Flexicore Co., Inc.*

PIPES AND FITTINGS

38—Pipe. Two catalogs: No. TR-270A (10 pages) contains data and suggested practices for cutting, connecting, and insulating Supreme plastic pipe. No. TR-273A (4 pages) gives pressures, etc., for ABS plastic pipe. *Johns-Manville.*

39—Pyrex drainline. Detailed information and advantages of corrosion-resistant glass system for disposal of chemical wastes are contained in 16-page catalog (PE-30/10-60). Includes photos, drawings, charts. *Corning Glass Works.*

40—Hose fittings. This 8-pager covers fittings and assemblies that are detachable, re-usable, and designed for medium- and high-pressure use. Color coding gives variations in end fittings. *The Lenz Co.*

41—Polyethylene pipe. Discusses quality, type, density, applications, installations. "All About Polyethylene Pipe," (J-2128, 8 pages) uses a cartoon figure to emphasize advantages of this pipe. *Union Carbide Plastics Co.*

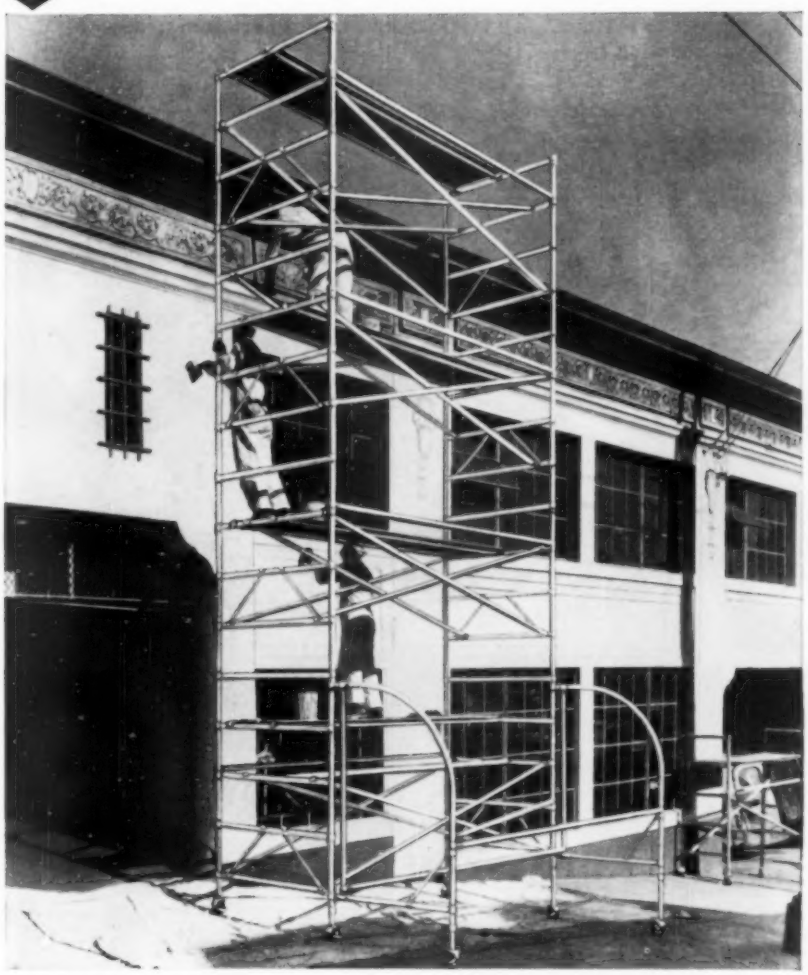
42—Strainers. Catalog No. 6008 (12 pages) describes self-cleaning strainers for steam, air gas, liquids (including cryogenic services). Details over 600 standard strainers; describes strainer selection procedure. *Leslie Co.*

Turn to page 219

6 MONTH PAINTING JOB CUT TO 4 MONTHS

Up-Right aluminum scaffold-on-wheels gets men up in the air fast...lets them finish the job fast! Lightweight and quickly assembled without tools or loose parts, Up-Right scaffolds are adjustable to provide a safe, convenient working platform at any desired height. In 3 basic types for overhead installation and maintenance.

HERE'S HOW INDUSTRY SAVES ON OVERHEAD MAINTENANCE WITH NEW ALUMINUM SCAFFOLD



5,000,000 square feet of building exteriors at Texas plant were painted from Up-Right rolling aluminum scaffolding at one-third savings in cost and time compared with conventional fixed scaffolding. The 2-story exteriors were painted progressively in sections—each section worked from a span scaffold measuring 10 feet long and 16 feet high. 5 sets of aluminum scaffolds were used on this 4-month project. Lightweight and rapidly assembled, the scaffolds were rolled with the job without disassembly.

Write for descriptive circulars

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In Canada: Up-Right Scaffolds, Ltd., 120 Russet Ave., Oshawa, Ontario

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CLARK EQUIPMENT COMPANY
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Acme ... the **practical** approach to air conditioning

Acme selected ... results excellent

Architecturally, a "gem" . . . throughout, a model of modern office efficiency, beauty and comfort. That's the word on the new Atlantic City Electric Co. Accounting and Data Processing Center, Pleasantville, N. J. On the air conditioning system, the word is Acme, and according to H. C. Moore, Jr., of John H. Moore & Son, Mechanical Contractors, it's a very good word indeed. "The owners wanted a system, at a budget price, that would function quietly, efficiently, dependably . . . one that would be easy and economical to operate and maintain. Acme was selected and . . . thanks to the high quality and unsurpassed performance of Acme equipment . . . results have been excellent, the owners are completely satisfied."

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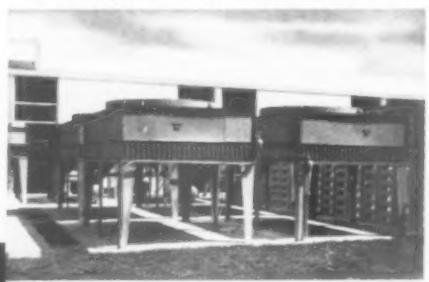

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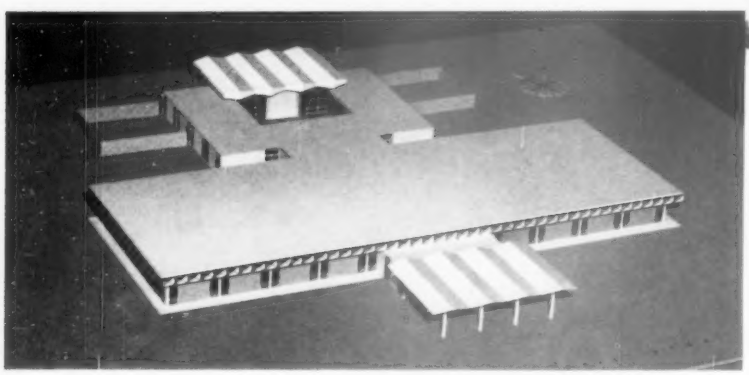

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Frank Grad and Sons, Newark

CONSULTING ENGINEERS:
Sears and Kopf, New York City

MECHANICAL CONTRACTORS:
John H. Moore and Son, Atlantic City

For more facts circle 535 on Reader Service Card

FACTORY / CATALOG NEWS

Begins on page 206

For more about these items, circle item numbers on Reader Service Card next to back cover.

43—Pipe, tubing tools, machines. This three-in-one catalog (Nos. 98, 99, 100) gives specifications, sizes, photos of tubing cutters, benders, wrenches, threaders, vises, power machines, etc. *Toledo Pipe Threading Machine Co.*

44—Pipe measuring. This 16-pager (No. 631), "How to Measure and Relate Pipe, Tubing and Hose Sizes," gives standard methods of measurements. Discusses similarities and differences in measuring various fittings. *Aeroquip Corp.*

45—Piping systems. Factors relating to temperature, motions, media, pressure, etc., are covered in three catalogs (Nos. 222A, B, C). This "complete engineering guide" gives details of anchoring and guiding systems. *Flexonics Corp.*

ELECTRICAL

46—Pushbutton stations. Bulletin GEA6544A (8 pages) tells about standard and heavy-duty pushbutton units and stations. Diagrams give dimensions; photos show heavy-duty station. *General Electric Co.*

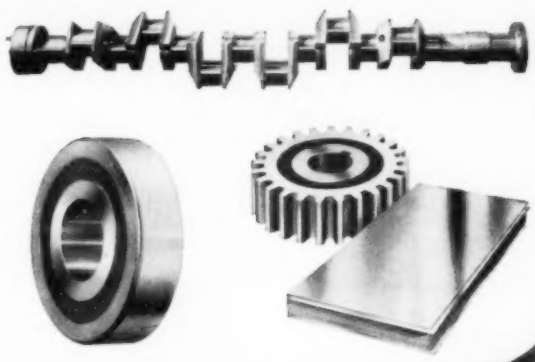
47—Measuring instruments. Here's a 12-pager (10-1.3) that describes instruments for maintenance, installation and proof-testing of plant electrical equipment. Includes instruments for other applications. *Associated Research, Inc.*

48—Indicator lamps, sockets. Construction and other details on electronic short-base indicator lamps, easy-mount single socket, multi-socket strip, and plastic color caps are given in Catalog 1-974 (4 pages). *Sylvania Electric Products.*

49—Motor control center. This 8-pager presents details of new safety-jack center for control of two or more motors from one location. Center offers easy access to all components and wiring compartments. *Rowan Controller Co.*

Turn the page

VALVOLINE
Tectyl
protects metals against RUST



There's a job for Valvoline Tectyl in your industry, protecting metal surfaces against rust and corrosion during shipping and storage.

Low-cost Tectyl rust preventives are widely used by the military services and by industry.

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Tectyl rust preventives meet exacting government specifications and there are more than 40 variations to meet every industrial need. *We suggest you write today for your copies of two helpful, detailed Tectyl charts, giving industrial and government specifications and applications.*

VALVOLINE
Tectyl RUST PREVENTIVES

VALVOLINE OIL COMPANY, Division of Ashland Oil & Refining Company
Refinery — Freedom, Pennsylvania — Home Office — Ashland, Kentucky

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Watch the way the experts — the riggers — move machinery! They work with Unisorb pads and Level-Rite mounting devices — save up to 80% in installation time and costs. Unisorb simplifies and speeds machinery relocation. No bolts, lag screws or time-consuming drilling is necessary. Labor savings at installation actually pay for Unisorb — and then some!

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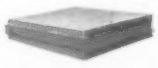
UNISORB LR LEVEL-RITE MOUNTS For heavy duty. Exclusive screw post design, steel base plate, Unisorb pad.

UNISORB LR 200 and LR 500. "200" is for business machines, light machine tools. "500" is for light duty machine tools.

UNISORB UL — Base plate (with recessed center) Unisorb Pad combination for machines with built-in leveling screws.



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FACTORY / CATALOG NEWS

Begins on page 206

For more about these items, circle item numbers on Reader Service Card next to back cover.

AUXILIARY

50—Driers, coolers, heaters. Catalog No. 16-E (24 pages, revised) includes new material on fundamentals of drying and selection of equipment. Sketches and photos show direct- and indirect-type driers, rotary coolers. *Hardinge Co., Inc.*

51—Compressors. This 16-pager (4F) gives construction, operation, and application information on jet compressors. Includes fixed-nozzle, manually and automatically controlled spindle types. Charts, photos. *Schutte and Koerting Co.*

52—Centrifugal pumps. New sizes that have been added to Model 3405 line of single-stage, double-suction pumps are described in Bulletin No. 721.6 (16 pages). Interchangeability chart, performance curves. *Goulds Pumps, Inc.*

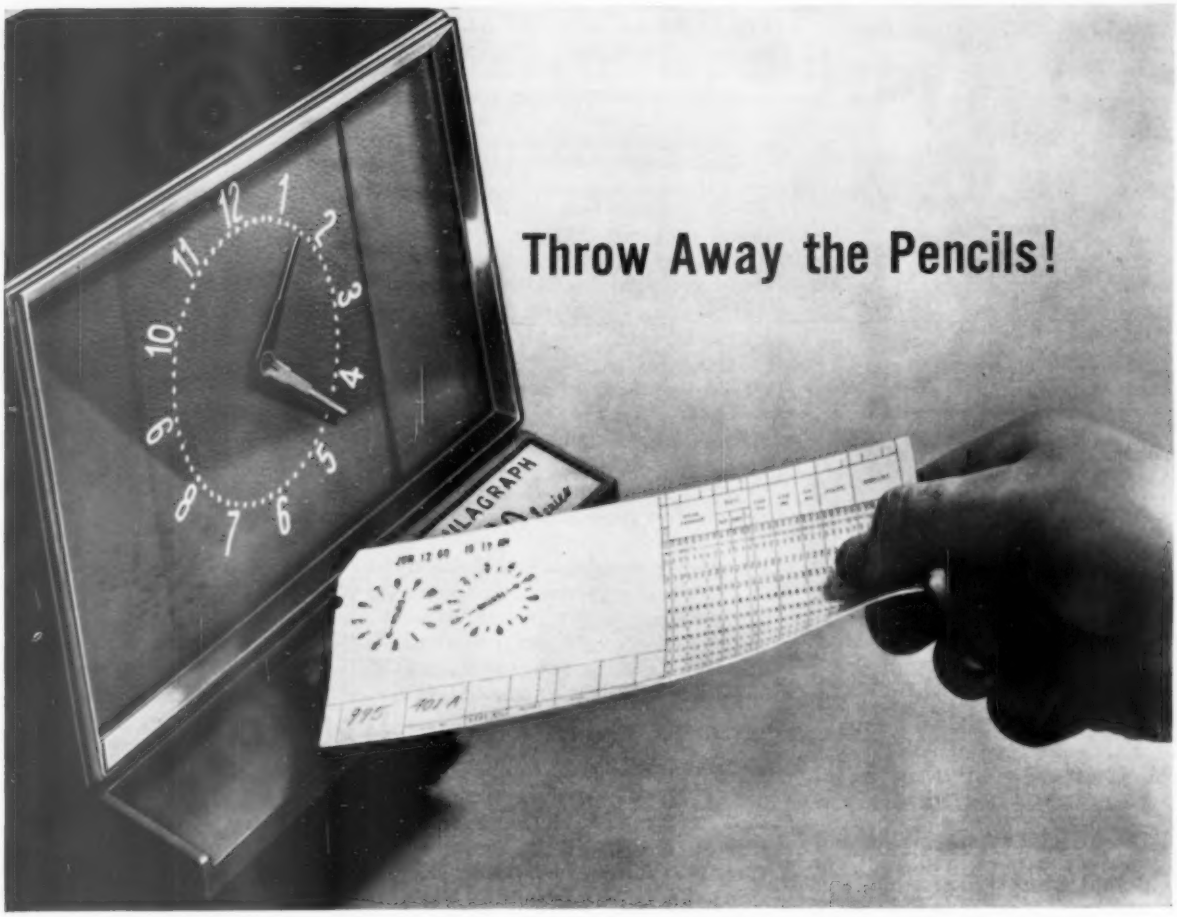
53—Metering pumps. Features, design, and construction details of new Series 100 pumps are discussed in 8-page catalog (420.100). Complete pumping systems are available, including tanks, solution mixers, etc. *Wallace & Tiernan Inc.*

54—Smoke ejector. Here's a 4-pager on Super Vac's newest propeller design—Twin-Prop Plus 21, which is cast in one piece of aluminum, with four balanced blades. Another booklet is a 12-page operation guide. *Super Vacuum Mfg. Co.*

55—Air cleaners. Catalog 1450 (8 pages) describes characteristics of electronic air cleaners and how they are applied to collect oil mists. Includes application and design data. Diagrams show mountings. *Westinghouse Electric Corp.*

56—Rotary compressor. This 16-page bulletin (ACO-100.4) presents new heavy-duty compressor for general-purpose service. Lists performance coverage—capacity to 21,000 cfm., pressure up to 250 psig. *Fairbanks, Morse & Co.*

Turn the page



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Your data collection system can be greatly simplified and attain greater accuracy with the new 500 Series Calculagraph because this completely new computing time recorder, based on the time-tested Calculagraph principle, computes as well as prints the actual time worked on any given production job. There are no complicated levers or buttons to set. The 500 Series makes the decisions. Production workers merely insert job cards at the "start" and "finish" of the job. The 500 Series does the rest. The actual time worked, with nonworking periods automatically deducted, is printed on the job card and ready for processing.

The 500 Series dovetails easily with any internal data processing system or outside service center. In smaller systems where the volume does not justify the use of machine accounting, this new computing time recorder can be a system in itself.

Investigate this new 500 Series now. Write or call for more details and, if possible, send us samples of your job cards for analysis.

INDUSTRIAL DIVISION

CALCULAGRAPH *Company*

273 Ridgedale Avenue, Hanover, New Jersey

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Brush or spray Adfinish on to any masonry surface, and you will beautify the surface while you protect it. Adfinish goes on easily over dry, damp or previously painted surfaces. Use it to:

Finish or refinish concrete
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Spark-up brick, block, stucco
Impart moisture resistance

Not a paint or plaster, Adfinish is a new adhesive finishing concept. It's easy-to-use, fire retardant; chemical, moisture and vermin resistant. Comes in three attractive colors.

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FACTORY / CATALOG NEWS

Begins on page 206

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57—Ventilating fans. New easy-to-install packaged fans are described in 4-pager (1160). Fans come in seven sizes, are direct-drive models with no belts. Table, diagram. *Modine Mfg. Co.*

58—Atmospheric burners. This 14-pager (H-1) presents eight gas-fired burners with maximum firing capacities from 10,000 to 2,750,000 Btu./hr. Dimensions, specifications. *Eclipse Fuel Engineering Co.*

59—Boiler cleaning. This Bulletin 2148 (12 pages) describes system for automatic boiler cleaning control. Covers control panels that are easy to operate and install. Photos show special panels. *Diamond Power Specialty Co.*

60—Tests for steam heaters. Bulletin 20 (20 pages) establishes uniform methods for conducting tests on heaters that use dry steam for heating. This revised and simplified Code supersedes Bulletin 10. *Air Moving & Conditioning Assn.*

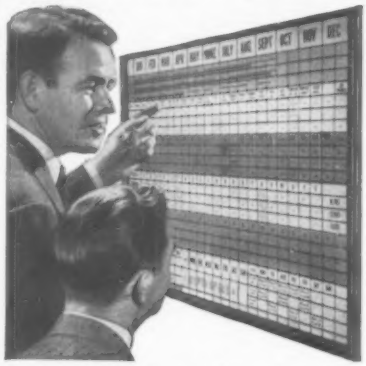
INSTRUMENTS AND CONTROLS

61—Motor controller. Design, operating features are set forth in 8-pager (14B9739). Said to be the lightest weight controller, it's the first starter in 2000- to 5000-v. range to use two-high control center. *Allis-Chalmers Mfg. Co.*

62—Timing instruments. Special-purpose, multi-purpose, split-second, decimal, and other timers are described in 16-page catalog. Explains exclusive features of instruments, and guaranteed repair service. Photos. *Heuer Timer Corp.*

63—Thermocouples, probes. This 60-page catalog contains specifications and other details on thermocouples, pressure probes, and allied components. Offers high quality "off-the-shelf" line at competitive prices. *Advanced Dynamics, Inc.*

You Get Things Done With Boardmaster Visual Control



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Cedar Rapids, Iowa

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look!..isn't this American rack installation a beauty?

American Rack installation at the Fleming Company, Topeka, Kansas. On left are open-end, drive-in racks, and on right are selective-type racks.

American adjustable STORAGE RACKS

are tough and rugged . . . designed to meet your storage problem most efficiently and economically!

American Open-End drive-in type racks

make aisle space storage space . . . ideal for bulk storage

Sturdy, load-carrying stringers are made of rugged square tubing from one end of a row to the other.

WHATEVER YOU WANT in storage racks, American's got it! . . . **SOLID CONSTRUCTION**—posts are specially roll-formed of extra heavy gage steel—stringers are one-piece continuous welded steel tubing—upright frames are cross-braced against sway—turnbuckles "level out" uneven floors . . . **QUICK ASSEMBLY**—all parts hook into place—no costly bolting . . . **EASY ADJUSTABILITY**—stringers work independently of any other part—they raise and lower like a window, on 4" centers . . . **TOP EFFICIENCY**—American racks utilize every inch of storage space—they save you time, labor and money from the very start of installation—they provide industry's highest safety factor for utmost protection.

American Slide-n-Lock selective type racks

for all types of merchandise—whether light packages or heavy metal products.

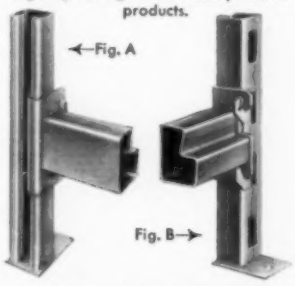

Fig. A—smooth line construction of aisle side of post and stringer eliminates hazardous protrusions. Fig. B—note rigid connection when stringer is "locked" to post.

send for catalog

AMERICAN METAL PRODUCTS COMPANY

STORAGE RACK DIVISION

5965 Linsdale Ave. amp® Detroit 4, Michigan

Manufactured in Canada by Sunshine-Waterloo Co., Ltd., Waterloo, Ontario

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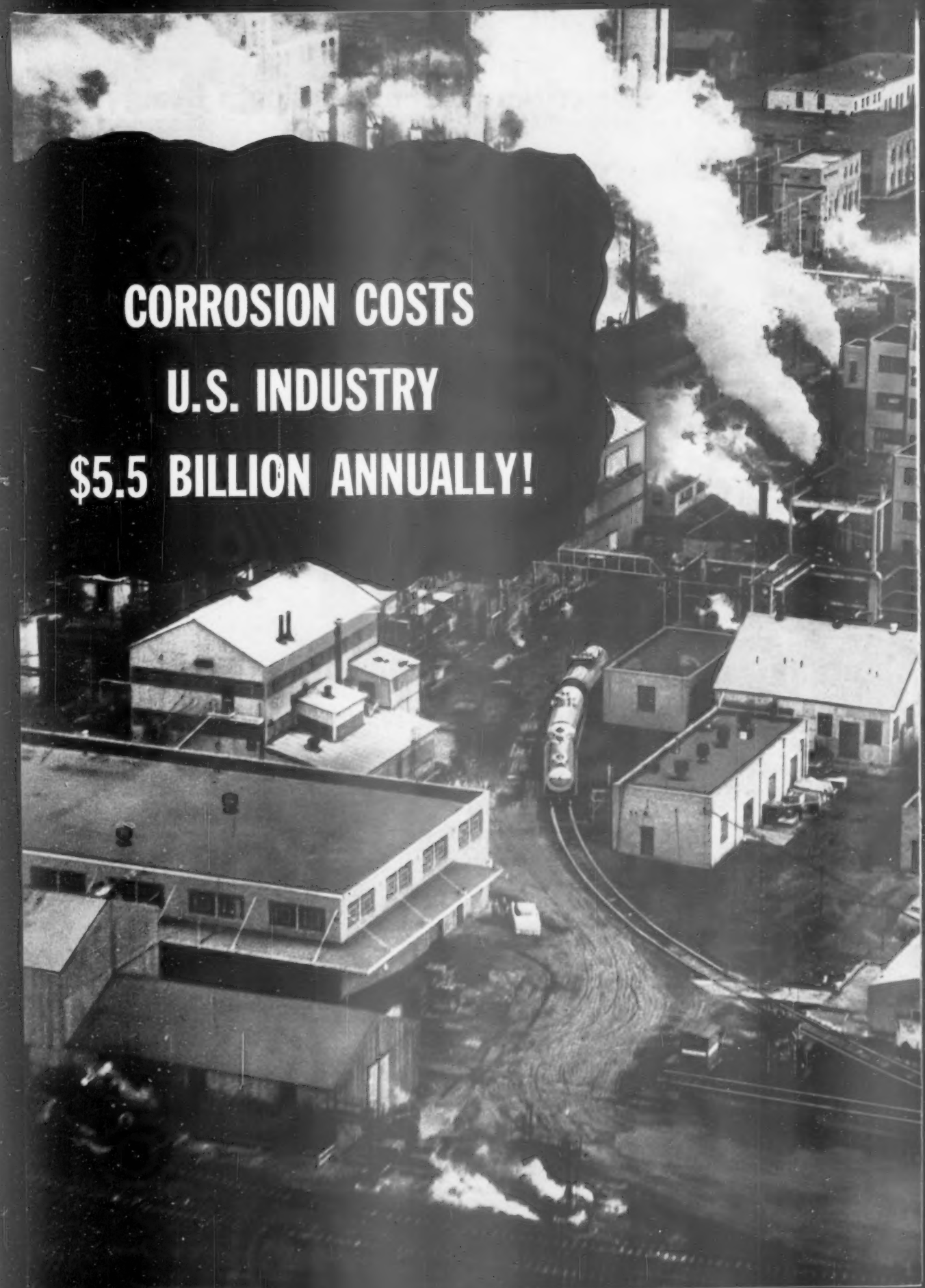

CORROSION COSTS
U.S. INDUSTRY
$5.5 BILLION ANNUALLY!

Now You Can Control 97% of All Your Corrosion Problems with this Proven PITT CHEM® Coating System!

Corrosion is one of the biggest profit robbers in American industry today. It is conservatively estimated that corrosion costs U.S. industry $5.5 billion annually . . . or $9,468 per minute! How much is this enormous waste costing *your* plant?

More and more corrosion engineers are turning to the *complete* PITT CHEM System of thick-film, cold-applied coatings for efficient long-lasting protection against corrosion. The PITT CHEM system is composed of over 20 different coatings, each formulated to control a specific type of industrial corrosion—from the most ordinary to the most severe—at minimum cost.

PITT CHEM Tarset, Tarmastic and Insul-Mastic are tough, *heavy film* coatings that outlast conventional maintenance paints 10 to 20 times. You measure their protection in *decades*, not years. They can be cold-applied by brush, spray gun or roller. No other family of protective coatings can solve so *many* of your corrosion problems so *economically*.

For your personal corrosion data file complete the coupon below and return it today. Then consult your nearest PITT CHEM Distributor—he's listed in the "Yellow Pages." He'll be glad to discuss your corrosion problems with you, and work out a corrosion protection program to meet *your* requirements, without obligation.

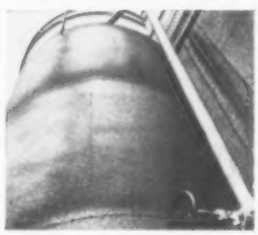
PITT CHEM TARSET®

The original, patented coal tar-epoxy coating, Tarset is being used throughout industry to solve corrosion problems that were once considered "impossible." This revolutionary cold-applied coating is ideal for the protection of underground storage tanks, pickling tanks, high temperature steam lines, waste tanks and similar equipment.

PITT CHEM TARMASTIC®

PITT CHEM Tarmastic coatings are a series of coal tar protective coatings designed to meet a wide variety of corrosive conditions at moderate cost. Their protective ability has been proven by years of service on concrete, stone and masonry surfaces, cooling towers, fan housings, tank exteriors, potable water systems and similar equipment.

PITT CHEM INSUL-MASTIC®



A series of high quality Gilsonite-asphalt mastics recommended for economical, long-lasting protection against moisture and atmospheric corrosion. Widely used as a weather and moisture barrier over metal buildings and equipment. Insul-Mastic insulating cork mastics provide good heat loss reduction and condensation control.

PITT CHEM PIPELINE ENAMELS

PITT CHEM Coal Tar Pipeline Enamels protect oil and gas transmission and distribution lines throughout the United States. These proven, high quality enamels are geared to meet a wide variety of underground service conditions and are backed by experienced technical field service.

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Includes a survey of corrosion problems in general industry, data on PITT CHEM Coating Systems and a coating selector guide.

Protective Coatings Division, Pittsburgh Chemical Co., Grant Bldg., Pittsburgh, Pa.

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1180

For more facts Circle 543 on Reader Service Card

Growing production and a few years' accumulation of new equipment can literally push your manufacturing operations out the back door. Usually, the only way to get more room is to . . .

BUILD a NEW plant or

When you're faced with a decision about providing more manufacturing elbow room, where do you start? This list will give you a basis for making the right choice.

To build a spanking new plant or do extensive modernization on the present one is a tough decision. It holds scores of pitfalls for anyone who makes a snap judgment. Whether he's on the team that makes the final decision or is just asked to supply information and advice, the plant man has to weigh scores of factors.

PRESENT PLANT SITE

First—and most important—factor is the present plant site. Here are 20 points that must be taken into consideration:

1. Site size. Good planning now calls for a site that's four to six times the present size of a plant. This provides for a rail siding, truck access and turnaround space, loading docks, parking, outside storage, and future expansion. But this extra space isn't always available at an old site. To expand outwardly it's sometimes necessary to use other buildings in the area. Or you may have to demolish some old structures.

2. Site location. Firms manufacturing or distributing consumer products should consider the advertising value of a major highway location. This is particularly true if the plant is architecturally pleasing and well landscaped. An old plant in the right location can always have its face lifted. Personnel managers recognize the importance of such locations—employees identify themselves with prestige companies that operate a widely known and recognized plant.

3. Topography. Swamp areas or rough terrain can limit plant expansion. But modern reclamation methods can solve many of these problems. Information available from the Corps of Army Engineers can even help you control flooding conditions in an area. But it's still a good idea to check such conditions with local residents.

4. Subsurface conditions. Even though soil-bearing and water-level conditions are adequate under your present plant, this doesn't guarantee they are the same next door. For an addition, test pits or borings should be made to determine suitability of soil for building foundations and heavy vibrating machinery footings. If basements or other deep excavations are necessary, the elevations of the water table should be known.

5. Public transportation. Female employees and unskilled low-wage male employees depend largely on local transit systems. A reliable, all-weather system, giving frequent service, should pass near the plant. A change from your present location to one not served by public transportation can mean a large loss in your labor force.

6. Highways and access roads. Accessibility is important to the worker who drives as well as to truckers. Also, the adequacy of roads can be a frustrating factor. Traffic jams are no fun for anyone.

7. Truck service. This item is playing an increasingly important role in plant relocation. In all cases, existing motor-truck franchises should be investigated carefully prior to final selection of a site. At your present site, you have probably established good working agreements with truckers. To avoid costly transfer of inbound and outbound shipments, make sure any new site provides direct truck routes to your major markets.

8. Rail facilities. With today's emphasis on truck transport, good rail facilities are often overlooked. This can be a costly error. Even when rail facilities are not needed immediately, they can become an important future consideration for three reasons: They're a hedge against indiscriminate rises in truck rates; they offer protection against labor trouble in the trucking industry; they increase the value of your building if you sell. In checking rail facilities, look into the frequency of service and the rate structure. Sometimes a small change in location has a significant effect on rates.

9. Dock facilities. Plants using water transportation extensively for obtaining raw materials or for shipping products usually find expansion at a present site more advantageous than relocation. Here prime considerations are nearness to piers, switching limits, lighterage limits, and transit privileges.

By JOSEPH A. ROSENTHAL
President, Engineers Incorporated
Newark, N. J.

EXPAND the OLD

10. Utility services. A plant without adequate service just can't operate. This is something every manager should remember when considering a move. If a move to a new site seems advisable, obtain commitments regarding services from utilities as well as local and state governments. Make sure there are no costly assessments for extensions of existing mains and lines.

11. Service companies. If you depend on other companies to perform some of your manufacturing operations, this factor should be considered in any proposed move.

12. Industrial environment. Patterns of neighboring industries in rates, working hours, shift schedules, and fringe benefits can weigh heavily in any relocation decision. Many times these may be in conflict with the carefully prepared personnel policies of a plant. Conversely, patterns in a new area can also be to a company's advantage.

13. Business climate. How do local and state governments feel toward industrial development? If your relations are good at your present site, chances are local officials will do everything possible to help you remain. Some communities have even financed the building of a new plant for a long-term industrial resident. On the other hand, poor business climate is a prime reason for relocation.

14. Proximity to residential areas. Certain industries release objectionable odors and smoke, or operate noisy equipment. Adequate space acts as a buffer zone and prevents annoyance to nearby residents. Any addition to a plant naturally reduces this buffer zone and may create an unfavorable local condition. If smoke and odors are a problem, the direction of the prevailing winds should be considered.

15. Building codes and zoning regulations. These can be an important obstacle to either new plant construction or a modernization project. In both instances it's important to contact local authorities regarding the type of industry as well as the construction planned. This way you're sure both are permissible under existing laws.

16. Community safeguards and protection. Most established communities offer fire and police protection. Also, they do a fairly efficient job of cleaning up the results of storms, such as snow removal. And some even have a plan for civil defense action. The trend toward building large plants in peripheral areas makes these community services an important consideration. Lack of such services can add greatly to the operating budget of a new plant. Even your insurance rates are based on these factors.

17. Other community services. Cultural, religious, and educational advantages of a community also play an important role in relocation. Established communities where plants have operated for years usually have well-organized facilities. However, when a plant moves to a new community and swells its population, it must be prepared to help support these activities.

18. Taxes. In order to encourage industrial developments, many states and communities have established firm, long-range tax advantages for new plants. Where no such advantages exist, check local and state tax structures to insure reasonable taxes on business, real estate, and property. In addition, consider assessments. They may indicate you're better off in your present plant.

19. Climate. Climatic conditions can affect many phases of your plant operation. For example, milder climates can result in lower heating bills, minimum employee absenteeism due to bad weather, and less maintenance of building and equipment. On the other hand, northern climates have always been credited with better productivity.

20. Proximity to markets. As the population shifts throughout the country, many companies find it advantageous to move their plants, too. However, in such cases reduction of transportation costs must be great enough to offset the increased cost of the new facility.

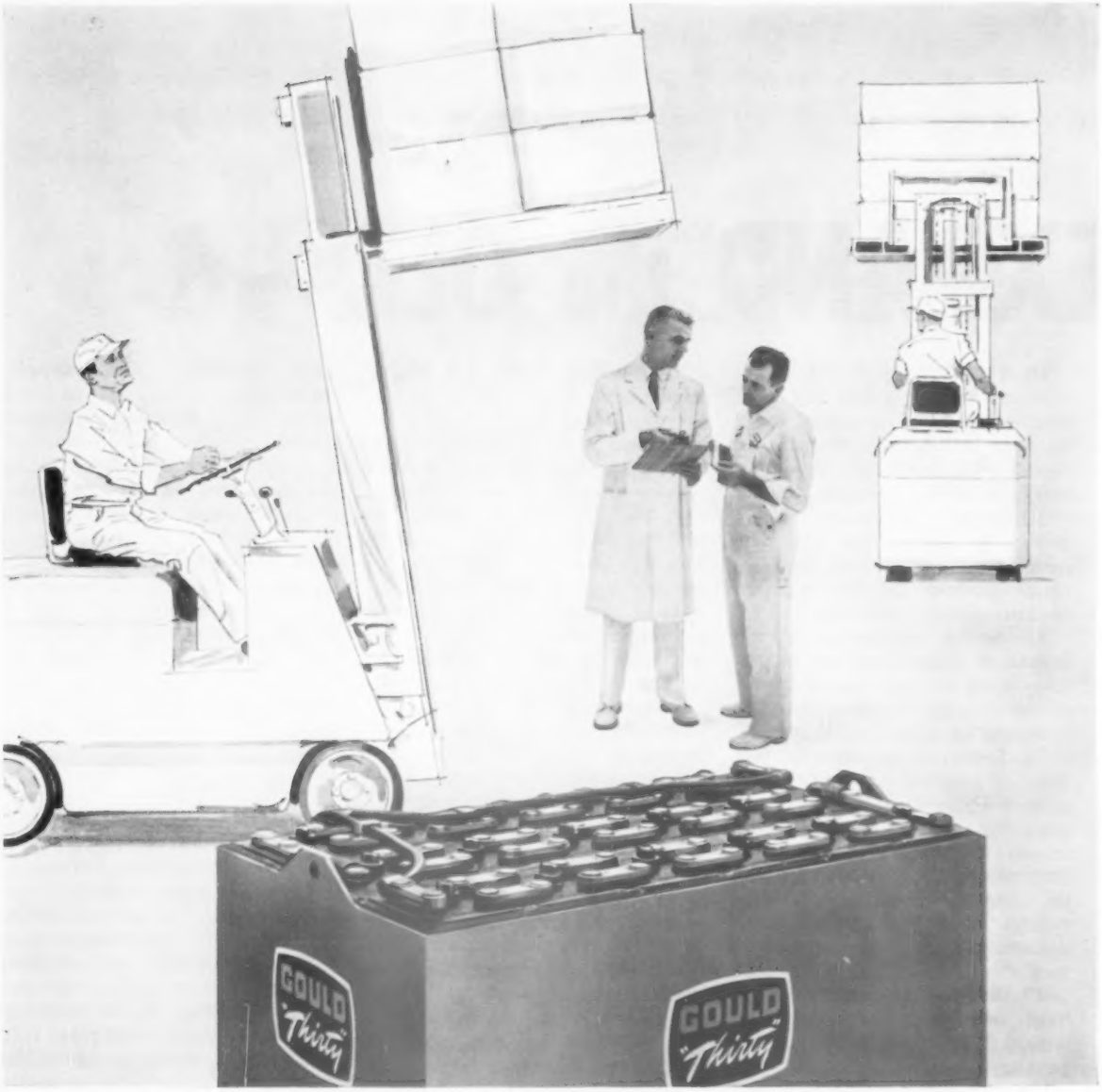
PRESENT BUILDING

Second most important factor in deciding to build or modernize is your present building. Here are eight major considerations:

1. Design. Architectural design is important for public relations as well as community and employee relations. But except for a few consumer industries, it's no reason in itself for scrapping an old plant. Usually a new façade on an old building or a new addition in front of the old structure will serve the same purpose.

2. Flexibility. Space requirements within a plant change with products and production methods. Building inflexibility can be a strait jacket. For example, customer demands for faster deliveries may mean more storage area to handle bigger finished inventories. Also, where progressive production replaces area manufacturing, varying floor levels within a building or between adjacent buildings become a critical problem. You can compensate for some inflexibility, but where it's impossible to do so, a move is usually indicated.

Turn the page



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3. Expandability. Many old buildings lack provisions for expansion. The fixed size of a building dictates the construction of a new plant more than any other single factor. There are many ways to provide for future expansion in a new plant: exterior curtain walls on the side of proposed expansions can be removable and non-load-bearing; foundations can be designed for expansion; vertical structural members can be designed to support upward expansion.

4. Structural members. Old plants sometimes need a structural member where you can't put one. But this is seldom reason enough for a new building. For example, one plant had to avoid putting a column or footing through an electric vault in modernizing. Here the new production floor was cantilevered over the vault to solve the problem.

5. Bay size. Structural members already installed can be as big a problem as missing ones. Older plants tend to small bay sizes. This limits flexibility. But unless the process involved is highly mechanized, layouts can usually be designed around steel uprights. When this is impossible, a new plant may be the only answer.

6. Overhead clearance. Lack of adequate headroom can restrict manufacturing efficiency. But sometimes the roof can be raised to provide added clearance. If overhead air space is available, this cube can be effectively used for conveyorized storage or for washroom and locker facilities. In either case, this will gain floor space.

7. Floors and floor loads. In most cases it's impossible to accommodate drastic increases in live loads. But sometimes you can circumvent such a crisis by reducing dead loads. One way is to substitute lighter materials.

8. Special facilities. Special-purpose buildings with built-in features can be a deciding reason for modernization. These facilities can't be moved and are too expensive to construct anew. But special areas like white rooms, sterile rooms, sound-proof rooms, or explosion-proof rooms can usually be installed in an older plant. This, however, isn't true of magnetic shielding for equipment or radiation protection that requires heavy layers of lead or an extremely thick mass of solid concrete. Some of these operations are so hazardous they cannot be safely introduced into existing buildings.

PLANT SERVICES

Third area to investigate is the type of plant services available at present and proposed sites. Check these eight items:

1. Air conditioning. This is usually thought of only in terms of human comfort. Although this is obviously important, uses of air conditioning are much broader than

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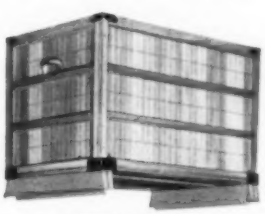

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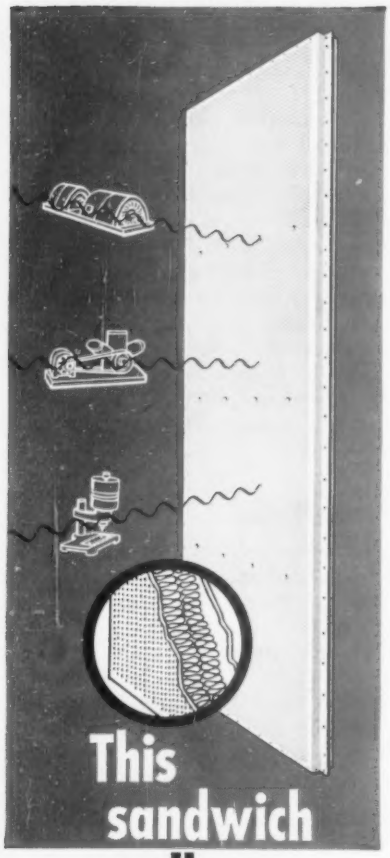

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230 **Circle 546 on Reader Service Card**

TO BUILD OR TO EXPAND?

Begins on page 226

generally known. One company manufacturing nickel-alloy ball bearings couldn't hold tolerances without air conditioning. In addition, hundreds of plants have found that temperature and humidity affect punched-card operations so severely that tabulating equipment is inoperative without air conditioning.

But even where this modern weather-maker contributes only to human comfort, it may prove profitable. This is especially true at plants where specific types of skilled labor are scarce and competition for it is active. In many instances, increased productivity contributes heavily to offsetting air-conditioning installation costs. The relative difficulty of air-conditioning certain types of plants adds to the problem of deciding whether to modernize or build a new plant.

2. Air pollution. In many industrial centers, fresh air is a scarce commodity. Yet, many industries *must* have fresh air to operate. Perhaps the best example is the pharmaceutical business where clean, uncontaminated air is required for many sterile operations. Expensive filtering devices can help solve this problem in old plants. However, rather than incur this expense and the high cost of maintaining the filters, some plants find it advantageous to move to the country.

3. Equipment upkeep. Having accurate cost figures on upkeep and maintenance of plant-service equipment will help you decide whether to remodel or build. Among the items you'll want to consider are boilers, compressors, diesel engines, turbine generators, pumps, and fuel systems. Check them for age and obsolescence. Then figure how their maintenance cost compares with that of new equipment. And be particular about finding out if they are performing as efficiently as they should be.

4. Heating. Not all plants migrating south have done so to save fuel. But no matter where you're located, there are ways to solve heating problems through modernization. If you need space that's now occupied by your boiler room for production machines, perhaps you should consider buying steam from

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Without sufficient make-up air, exhaust hoods can't do their job properly. Plant air becomes contaminated with fumes, dust, and odors. Workers' health suffers. Absenteeism rises; production lags. Other vacuum problems crop up: hot spots at inside areas, cold drafts along walls.

Solution: install a make-up air system -- fans to bring in outside air, and heaters to temper it. A make-up air system like this cancels out vacuum, gives balanced heat and ventilation.

For technical help on make-up air, see your Consulting Engineer. Or call in Sturtevant application engineers. They're experts in handling air...whether you want to move it, heat, cool or clean it. J-00711

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an outside source. Or if you find the steam you're buying is too expensive, you can generate your own. And, of course, you may be able to cut costs drastically by insulating your old building.

5. Scrap and waste disposal. Before you decide a country plant is just what you need, check into scrap and waste disposal. You'll find large urban areas have far better sewers and incinerator facilities. In addition, the local scrap buyer won't give you as good a deal if he has a long haul from your plant.

6. Water pollution. That pretty little stream running through the property you are considering for a new plant site may be a wonderful spot for company picnics. But don't count on it to carry away plant effluent. In the first place, state conservation regulations probably won't permit it. And if they do, chances are it won't carry it away fast enough or in large enough quantities. Better look for a big bay to dump it in or a site with large industrial sewers.

7. Gas supply. If your requirements for gas expand, you can take advantage of almost unlimited quantities of natural gas if your new facility is near a major transmission line. Also, you can usually buy it at off-peak or dump rates.

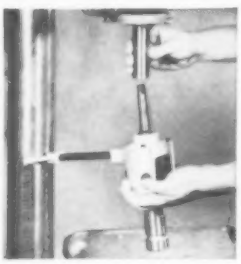
Don't overlook the fact that most of these companies reserve the right to cut you off their lines if the demand at regular rates requires it. This should not deter you, though. Standby equipment burning LP gas or oil can handle such emergencies. But this won't do you much good if you use gas as a raw material rather than as a fuel.

8. Location of service lines. Nearness of service supply lines is a definite requirement, but usually doesn't require much creative thinking. Still, don't overlook an opportunity to save money at a new plant site. Public Service Electric & Gas Company in New Jersey located a generating plant alongside Esso Standard Oil for a specific reason. It buys oil from Esso at a good rate, then sells excess steam to Esso. Creative planning is paying off for both.

Turn the page

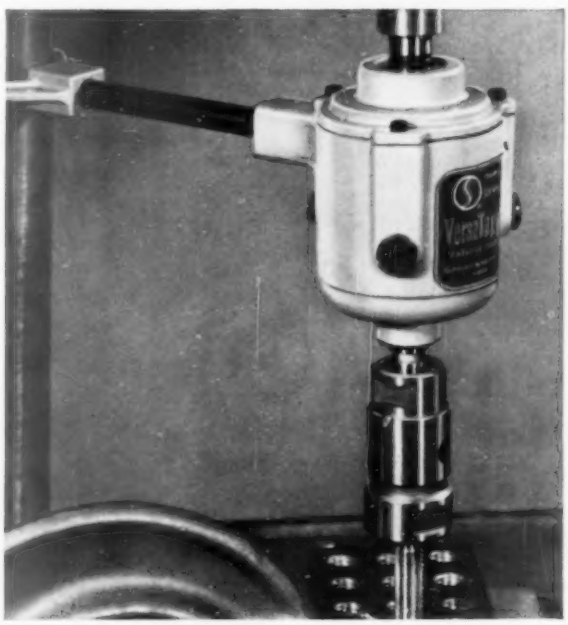
iT'S A FACT!

You can tap 1/2" holes with a light drill press and Supreme's New VersaTAPPER®



Shaft of Model 6100 is held in drill press chuck. No. 6200 (above) has Tapered spindle.

Supreme Accutap Chuck is standard equipment with VersaTAPPER. Capacity 0-½"



VersaTAPPER is a compact precision-made tapping unit. Fits any drill press . . . features half-inch capacity range plus 4-time increase in torque. Easy to install. Simple and quick to remove after use.

VersaTAPPER...
operates easily in any material
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The *new* VersaTAPPER has scored an instant success with production people everywhere. It has more versatility than other tapping devices. It has the *widest capacity range*—from 0 to ½", but depending on application, use of taps smaller than No. 10 is limited. It develops *more power*—makes the tapping of ½"-13 holes a simpler matter, even with light duty drill presses. VersaTAPPER is *simple to use*—can be successfully operated by anyone in your shop.

All of these features at the remarkably low price of $63.00 complete marks VersaTAPPER as a product you must see at the first opportunity. It's available at your local Supreme Chuck distributor. Call him soon.

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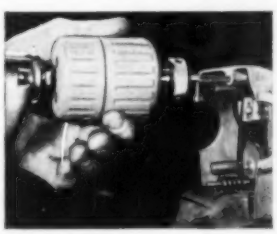

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TO BUILD OR TO EXPAND?

Begins on page 226

ELECTRICAL SERVICES

These are fourth on any checklist for proposed expansion. There are potential pitfalls here, so be sure to check these 11 factors:

1. Dependability of service. Nearly every plant has experienced some work stoppage and loss of production from power failure. Such losses can be extremely costly if in-process products spoil. For example, a producer of photographic film can lose thousands of dollars if power failure occurs.

2. Rates. Costs are important to every manufacturer. The rate structure of the utilities serving a present and proposed location can affect a company's thinking. Could even be the deciding factor if power consumption is very high.

3. Voltage. Some companies need unusually high voltage levels for welding, plating, testing, and other special manufacturing purposes. The availability of such service at existing locations encourages modernization. On the other hand, a move might necessitate the added expense of bringing these services into the new plant.

4. Installation cost. Rapid expansion of a plant's production level can obsolete the capacity of the electric lines serving it. Then the question of cost arises. Will it cost more to bring in new lines than to move where the required capacity is available? Here much depends on the amount of cooperation the utility is willing to provide. Some will pay for a new substation or bring in new lines to get or keep a plant. Others let the plant bear this expense.

5. Substations. Are present substations big enough? And if not, can capacity be added? If it can't be, a move may be necessary. Plants requiring high-voltage power should carefully investigate space and cost requirements for substations. Frequently, an extension to existing equipment can make it adequate for many years' more service, whereas these units might have to be scrapped if the plant were relocated. However, there's another factor in favor of modernization. Although new high-voltage substations require substantial areas, they're usually in-

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• Larger than three football fields, Trans World Airlines' new multimillion-dollar jet maintenance hangar at Los Angeles International Airport was designed by Holmes & Narver, Inc., of Los Angeles, working with TWA's Facility Design, under direction of E. T. Phillips. Diversified Builders were General Contractors. COLOR DYNAMICS was used by Murray Painting Co.

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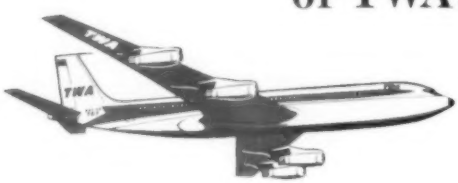

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stalled outdoors for adequate clearance requirements. This means they don't take up valuable space within the plant.

6. Alternate power sources. This means either atlernate feeders from the main utility source or a standby unit if there's only a single source. This is a particularly important consideration where continuous processes are involved. One dye company went out of business after failing to win a suit from a utility to recover damages for a batch of dye lost during power failure from a single source. Make sure any new site offers alternate sources.

7. Auxiliary equipment. Some plants have large investments in motor generator sets, diesels, and other electrical equipment. The cost of moving these units, plus the loss of productive time, will contribute to any decision.

8. Cycle control. Only scattered areas still use 50-cycle power. But it can cause a lot of trouble. Also, most utilities control 60-cycle better than others. If close cycle control is needed for test purposes, service at any proposed site should be carefully checked.

9. Local codes. Some are restrictive, some unnecessarily severe. You may be in for a shock if you move without first checking requirements thoroughly.

10. Radio and TV interference. This point can alienate people. Electronic plants in particular find certain equipment impossible to shield, thus must stay away from residence areas.

11. Odd voltages and cycles. This is particularly important in a move overseas. Extreme care should be taken to find out about electrical practices. Germany, for example, has 220-volt service like most of Europe. But Milan's is 160-volt. And both are 50-cycle.

FINANCING

Many operating people have a mistaken idea about financing a new building or getting the money to modernize an old one. Raising money for such projects depends on more than brick, mortar, and fine mahogany paneling. Financial men

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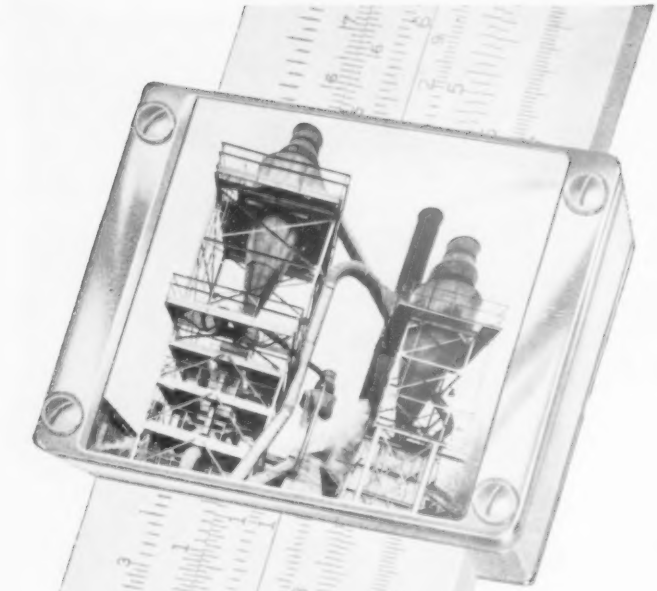
PREVENT MOTOR BURNOUTS...
SPECIFY KLIXON PROTECTORS ON SINGLE AND THREE-PHASE MOTORS

For more facts Circle 556 on Reader Service Card



Dust Control is a job for Engineers

The "rule of thumb" methods of the inexperienced, or the "engineering rules" of an experienced design, fabrication, and installation firm—which will you select for your dust control problems?

Kirk and Blum offers you . . .

ENGINEERING—a staff of qualified engineers with proven ability to solve your dust control problems.

RESEARCH—continuous research on full scale equipment, to develop the most efficient systems.

EXPERIENCE—over 50 years of dust control service to the woodworking industry.

Every Kirk & Blum installation is based on a complete service: Design — Fabrication — Installation, backed by K & B's acceptance of One Undivided Responsibility for the system to assure your satisfaction.

On your dust control problem consult Kirk and Blum, craftsmen in dust control for the woodworking industry, where fine craftsmanship is appreciated. The Kirk & Blum Manufacturing Company, 3209 Forrer St., Cincinnati 9, Ohio.

KIRK & BLUM DUST CONTROL SYSTEMS

are businessmen. If anything, as a group they are more hard-headed than manufacturing people.

The first thing financial men want to see is the company's profit-and-loss statement and balance sheet. Even then, a big net worth may not be convincing in itself. This is particularly true if it is accompanied by an erratic growth pattern and fluctuating earnings. These men find steady growth and consistent profits much more impressive.

There's another erroneous impression about financing. Some manufacturers feel it's easiest to finance a fine-looking, beautifully landscaped new building with extensive parking lots. This just isn't true. If you can't make money in such a building, you can't finance it.

In fact, you may find it easier to finance a building in a depressed rural area than in a new industrial park. The reason for this is obvious. Government officials and local businessmen in depressed areas usually want new industry to move in. Thus, they're willing to help finance a new building or the modernization of an old one. For example, in some areas the state will pay 50% of these costs and the local government or civic group will pay another 30%. This leaves only 20% as the manufacturer's share.

But don't jump too fast into what seems to be an advantageous financial arrangement. You need to consider operating costs as well as initial costs. Here a careful cost comparison of operations in a modernized and new plant is a must. A comparison of depreciation costs will also help your decision.

How does a manufacturer go about financing a modernization or building project? There are many ways and each has innumerable variations. Most fall into definite patterns. But the contributing factors, such as ownership, taxes, and depreciation, are all so closely related that it's impossible to discuss them separately.

For example, the financial question depends on whether a company owns or only leases its present plant. If it owns the plant, invariably there's a mortgage plus some equity.

Turn the page

Inadequate fire protection. Result: a staggering fire loss at this refinery.

This fire need never have spread!

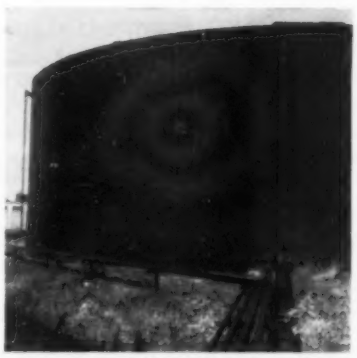
This tank fire did tremendous damage. 30 hours after it started, it was still crumpling storage tanks, buckling railroad cars, twisting track.

Grinnell ProtectoFoam Systems could have saved many of these tanks

When fire breaks out, a Grinnell ProtectoFoam System is ready to go into action. It quickly spreads a uniform blanket of fire-choking foam that covers and extinguishes the blaze. Surrounding tanks are saved.

Grinnell offers you fire protection systems for petroleum products, chemicals, alcohols, solvents, paints, liquefied gas. You benefit from 90 years of fire protection experience when Grinnell designs and installs your systems.

Free 16mm. Sound-Color Film. Grinnell's 35-minute film — "Fire Protection Through Research" — demonstrates all types of special fire hazards, and how to guard against them. To borrow this film — without charge — write: Grinnell Company, Providence 1, Rhode Island.



Grinnell ProtectoFoam protection. This bulk oil storage tank is guarded against destruction by fire.

GRINNELL

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are filled with up-to-date technical information. They provide background knowledge for smarter decisions.

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TO BUILD OR TO EXPAND?
Begins on page 226

Thus the company has several choices for financing modernization or new construction. It can finance the project from company funds, renegotiate a new first mortgage, obtain a second mortgage, sell stock, or float a bond issue.

At this point, consider the tax picture and along with it, depreciation and write-off. There are some tax advantages if a company decides to stay in an existing building and modernize it. In this case, the company can write off the costs of engineering and tearing out old construction during the current year. The cost of new construction, however, must be capitalized. But the depreciation period is always less than the life of the building. Thus a tax saving may be realized. In any case, before you let taxes influence your decision, consult a good tax attorney.

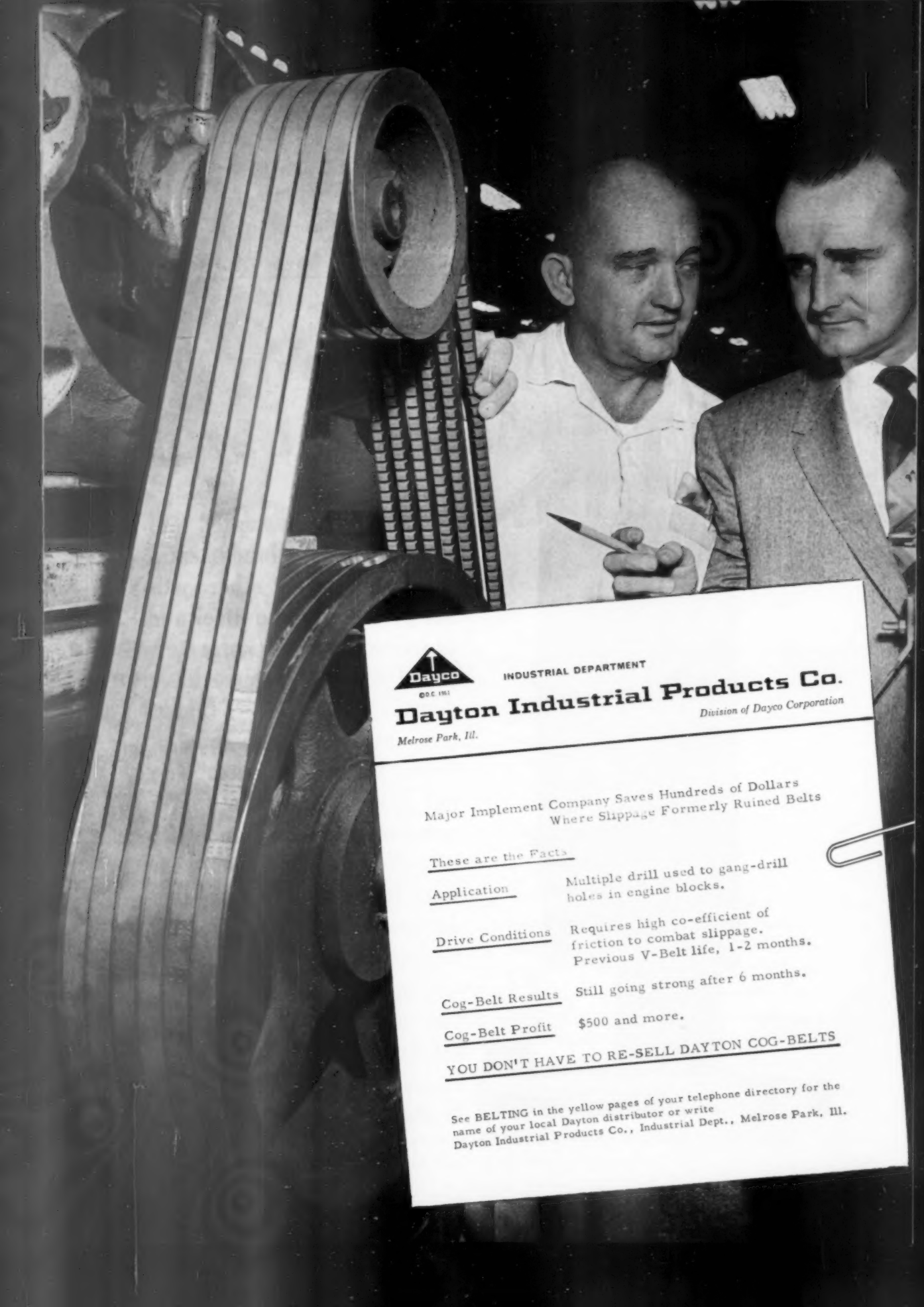
After it's modernized, a company can retain the plant or sell it, then lease it back. Of course, such a sell-lease-back deal can be made before modernization. But then the price and the terms are usually not as good. However, there is one advantage in entering a sell-lease-back arrangement. Sale proceeds can be used to modernize the plant. And any cash left over can be added to working capital.

Selling a building after modernization quite often results in a capital loss. This can happen even if the company sells only the building and holds the land. Here the valuation put on the land can determine the amount of the loss.

A manufacturer can install air conditioning, new lighting, or new heating equipment on a lease-purchase contract with the contractor or equipment manufacturer. From a tax standpoint, it doesn't matter whether he owns, leases, or rents the plant. The tax laws consider this a straight purchase on an installment basis.

To finance a modernization or new construction project, most people think first of banks and insurance companies. However, company retirement trust funds are also being used more and more for this purpose. Like everything else, it pays to explore all avenues. **END**

Circle 559 on Reader Service Card for items on next page



Dayco

INDUSTRIAL DEPARTMENT

Dayton Industrial Products Co.

Division of Dayco Corporation

Melrose Park, Ill.

Major Implement Company Saves Hundreds of Dollars Where Slippage Formerly Ruined Belts

These are the Facts

Application	Multiple drill used to gang-drill holes in engine blocks.
Drive Conditions	Requires high co-efficient of friction to combat slippage. Previous V-Belt life, 1-2 months.
Cog-Belt Results	Still going strong after 6 months.
Cog-Belt Profit	$500 and more.

YOU DON'T HAVE TO RE-SELL DAYTON COG-BELTS

See BELTING in the yellow pages of your telephone directory for the name of your local Dayton distributor or write Dayton Industrial Products Co., Industrial Dept., Melrose Park, Ill.

The powder-actuated tool shown here is a fundamental improvement over other methods of fastening to steel and concrete. Five years of extensive field experience have demonstrated that its fastenings are at least the equal of those made any other way. But it will make them faster, more economically, and with less effort required from your work force. It's called the Duo-Jobmaster and it's part of the Ramset Fastening System.

For immediate service, call your local Ramset dealer. He's listed under "Tools" in the Yellow Pages. For information write to: ***Ramset Fastening System***

WINCHESTER-WESTERN DIVISION **Olin** 288D Winchester Ave., New Haven 4, Conn.

For more facts Circle 560 on Reader Service Card

By our method of reporting unemployment...

We're Giving The United States A Black Eye That Is Not Deserved

The way in which our unemployment is reported is giving the United States an undeserved black eye around the world. The broad concept of unemployment we use exaggerates the amount of unemployment in the United States as compared to most other countries. Our reporting system also falls short of presenting a balanced picture by concentrating on people who are idle, while neglecting jobs that are idle because people cannot be found to fill them. This editorial explains these defects and suggests improvements.

The *Monthly Bulletin of Statistics*, issued by the Statistical Office of the United Nations, has become a standard reference for international comparisons of economic performance, including employment and unemployment. Here, from the November, 1960 issue, is part of a table giving comparative figures on the rate of unemployment for the United States and a group of European countries:

	UNEMPLOYMENT RATE	
	Annual Average 1959	Jan.-June Average 1960
West Germany	2.4%	1.0%
Netherlands	1.8	1.4
Sweden	2.0	1.8
United Kingdom	2.3	1.9
United States	5.5	6.1

A Distorted Picture

If taken at face value the table clearly says that the United States is doing far worse in providing jobs for its citizens than the other countries whose unemployment records are listed.

But the figures are deceptive. They are made so, in part, by our government's use of a much broader concept of what constitutes unemployment than is used by most other countries.

Sweden provides a clear case in point. The table indicates that during 1959 Sweden had an unemployment rate of 2.0%, while the rate in the

United States was 5.5%. But a report from Sweden, published in the U.S. Department of Labor's *Labor Developments Abroad*, indicates that if they had used the same methods of calculating unemployment as we, the reported jobless rate in Sweden would have almost doubled. Thus a large portion of the gap between the unemployment rate in the United States and the unemployment rate in Sweden would have been eliminated.

Graduation To Unemployment

In general, countries listed in the table use registrations at public employment agencies as the basis for calculating their unemployment. Our Department of Labor, in making its sampling of unemployment, includes unregistered young people who are waiting for jobs or training opportunities as well as housewives who are looking for jobs in a general sort of way but who have not registered anywhere in search of them.

It used to be that graduation from college was regarded as a day for great celebration and rejoicing. But, because of the way the Labor Department does its counting of unemployment, it is now a day of sorrow. For unless our young people immediately rush off to jobs, they graduate into unemployment and swell our jobless figures.

While our government very expansively counts all the unemployed, there is no offsetting report on the number of jobs that are unfilled because no one qualified can be found to fill them. Currently there are many jobs in this category, and it is to be expected that there will be more as the technological revolution picks up momentum.

A properly balanced report on unemployment would include a record both of people who are idle, as conceived on some standard international basis, and jobs that are idle. A combination of the two sets of data would provide a much better indication of the economic health of a nation than unemployment alone.

The United Kingdom regularly collects figures on unfilled jobs as well as the number of unemployed. Thus it is not an impossible task to collect information on idle jobs. **For a fast moving economy, such as ours, the collection of statistics on unfilled jobs presents special difficulties. But this information is so important that Congress should see that it is added to our employment and unemployment records.**

A National Disservice

There is not the slightest inclination here to minimize the amount of unemployment in the United States at any time, or the crucial importance of doing everything possible to keep it at rock bottom. If the reporting of unemployment were simply for domestic consumption, it would be possible to make an appealing case for using a very broad conception of it. This is one way of underlining the importance of the problem.

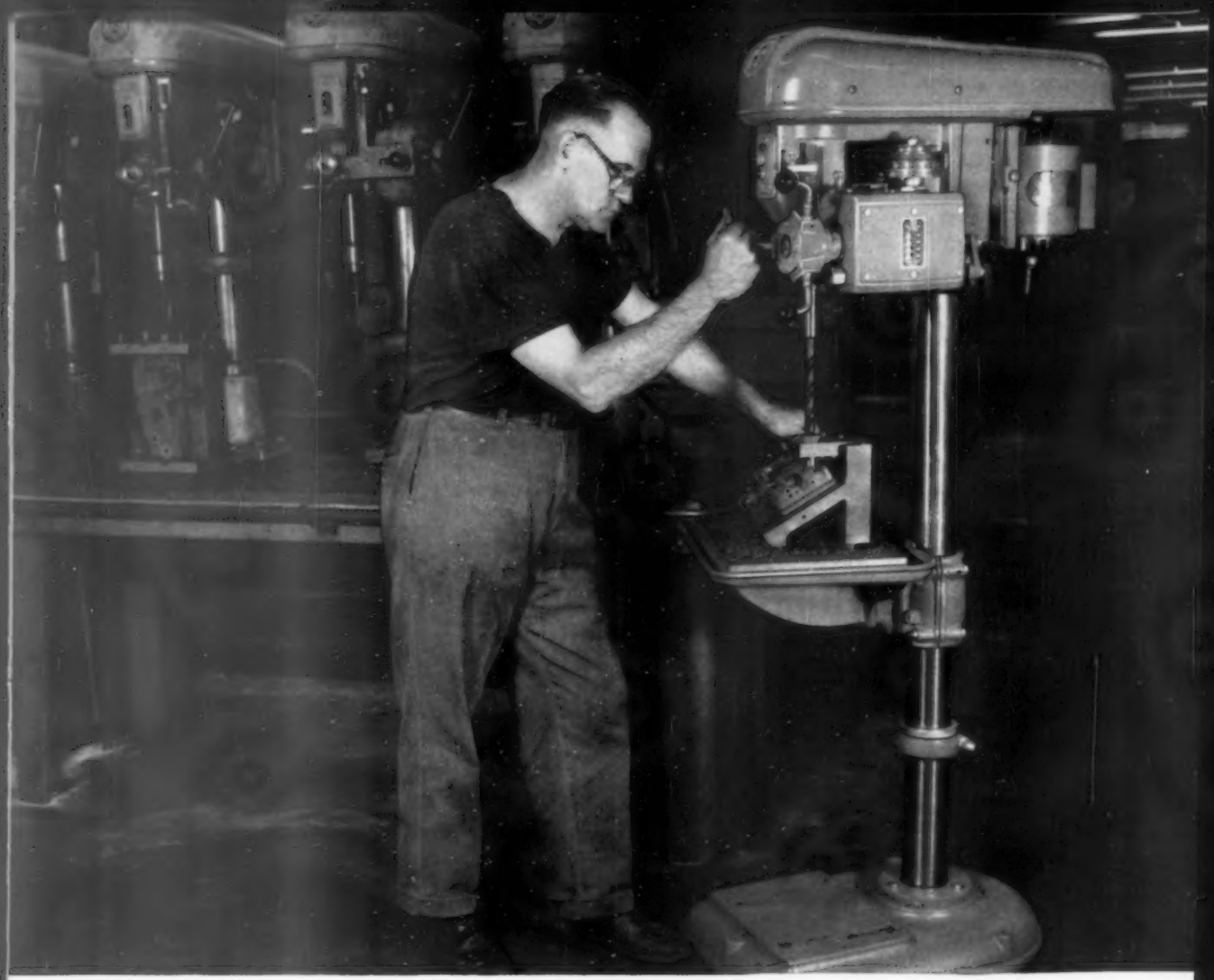
But when, as is the case, international comparisons of unemployment are treated as key gauges of the effectiveness of different economies, we do ourselves an important national disservice by using an exceptionally commodious concept of unemployment. American travelers abroad can testify that they are continuously being called upon to explain why the United States does such a relatively poor job in providing employment for its people. This is an unwise and unfair burden to impose upon the nation. **We make enough mistakes of economic commission and omission without issuing reports that distort our economic performance to our own discredit abroad.**

This message was prepared by my staff associates as part of our company-wide effort to report on major new developments in American business and industry. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or part of the text.

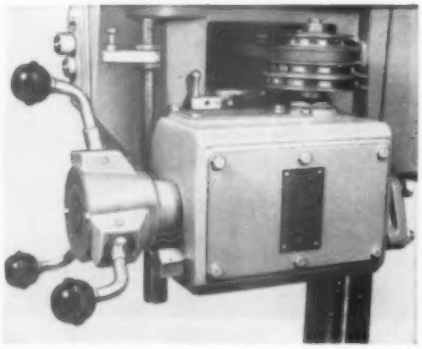
Donald C. McGraw

PRESIDENT

McGRAW-HILL PUBLISHING COMPANY



You can do more with these ALL NEW DELTA 17″ drill presses



Equipped with exclusive new Rockwell Power Feed, these presses can operate in remote control or be interlocked with automation devices. Available as original equipment or as an accessory on every model.

FREE BROCHURE—Complete specifications on the new Delta 17" drill presses and accessories. Write: Rockwell Manufacturing Co., Delta Power Tool Division, 628D N. Lexington Ave., Pittsburgh 8, Pa.

Here's a major engineering advance from Delta to give you increased drilling accuracy, more job flexibility and greater operating economy. You can choose from 76 models that incorporate these up-to-date performance features: New Internal Depth Stop Mechanism, Quick-set Depth Gage, Interference-free Guard and Pivot-type Motor Mount.

These drill presses are completely new—not merely improved or restyled—but actually redesigned to deliver consistent precision operation under the most rugged work loads with little or no maintenance.

Your Delta Industrial Distributor (listed under "TOOLS" or "MACHINERY" in the Yellow Pages) will gladly demonstrate how these 17's can save you dollars, hours and material. Why not call or see him soon!

DELTA INDUSTRIAL TOOLS

another fine product by

ROCKWELL

For more facts Circle 561 on Reader Service Card

How do you measure the value (or cost) of air?

If you have this problem in new plant design or in existing buildings . . . exclusive BARBER-COLMAN WEATHER-KING FLUSH and CAM ACTION OVERdoors will save you more money in over-all plant operation costs and production efficiency!

When plant function and design require controlled temperature, humidity, air pressure, or dust-free areas—the fundamental performance of doors must be dependable. Control of door opening-closing, tight sealing, as well as insulating properties, has direct bearing on air control . . . and its cost!

This is why Barber-Colman OVERdoors are being specified in more plants today. They offer the double dependability factor of exclusive Cam Action and Weather-King Flush construction. This combination of standard equipment seals tighter . . . guards against air leakage . . . and meets a broader range of insulating requirements. The cost is so little more . . . the performance benefits so much greater!

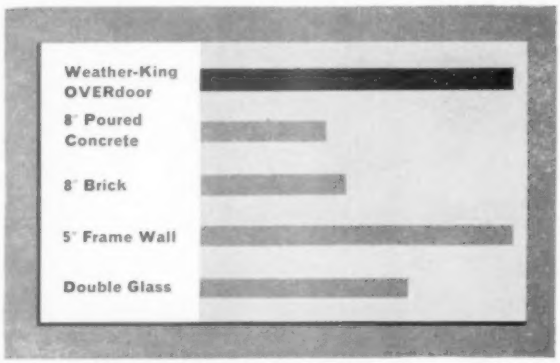
What is Weather-King Flush construction? How does it meet extra performance requirements? How does it decrease operating costs?

Standard, lifetime-guaranteed, Weather-King Flush 1¾" door sections have vermin and decayproof, honeycomb core . . . provide better insulating properties of isolated dead-air cells. Special retempered hardboard facings are bonded to each side . . . vapor-sealed . . . provide greater impact resistance and structural strength. Further, standard Weather-King Flush is furnished with a complete factory-applied, two-coat prime paint . . . selected for its excellent "hold-out" and resiliency qualities.

The insulating factor of Weather-King Flush OVERdoors (U = .259) compares with other materials as follows:

Continued next page

Two and one half times better than 8″ poured concrete. Almost two times better than 8″ brick. Same as a standard 5″ frame house wall (including plaster). Over one and a half times better than double glass windows.



Comparative insulating property of a Standard Barber-Colman Weather-King Flush Section

For special insulating requirements, Weather-King Flush Sections are available in varying thicknesses up to 5″ . . . with either styrofoam or polyurethane core and a selection of 26-gauge galvanized steel, stainless steel, or fiberglas facings.

How does Cam Action work? How can it seal so tightly . . . yet operate so easily?

CLOSING
Note tight fit against door stops . . . no chance for air or dirt leakage.
OPENING
Door sections move back ¾" from casing . . . no binding (from swelling) during opening or closing.

When the door is nearly closed, this unique Cam Action automatically moves the entire door unit tightly against jamb stops . . . sealing all sides. When opening, the door is automatically released ⅜″ from jamb . . . moves freely and easily upward . . . never binding or sticking.

Cam Action has been tested and performance-proved on government dehumidification warehouses, meat-packing plants, dairies, manufacturing industries. Laboratory test results of Cam-Action closing against a gasketed jamb show:

Wind velocity	Air leakage
45.6 mph	0 cu ft min/ft door edge
69.2 mph	0.05 cu ft min/ft door edge
122.4 mph	0.225 cu ft min/ft door edge

Exclusive Barber-Colman Cam Action and Weather-King Flush OVERdoors work hand in glove to give you double dependability . . . pay off in better product quality control, employee comfort, much lower in-plant cleaning and maintenance costs!

Environmentally controlled building with Barber-Colman OVERdoor.

Let your Barber-Colman specialist (see yellow or white pages) show you the Barber-Colman Door Inventory Plan for integrating plant doors to building function . . . to help you anticipate . . . plan . . . prevent unnecessary plant operating costs!

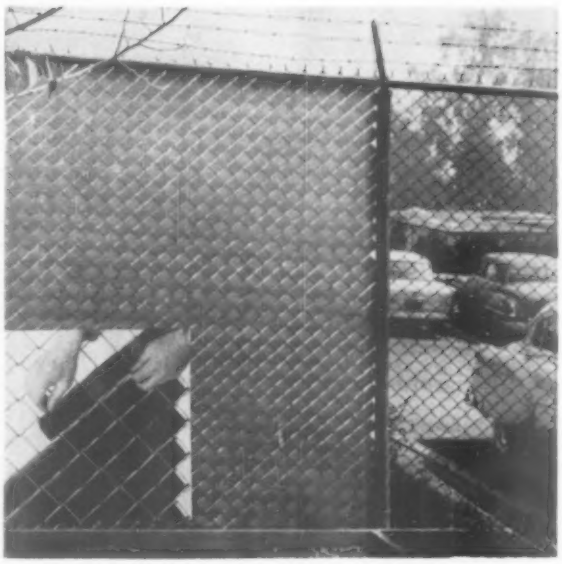
SEE OUR CATALOG IN SWEET'S OR WRITE FOR COPY
AIA File 16D

THE MARK OF QUALITY
BARBER COLMAN

BARBER-COLMAN COMPANY Dept. AF14, Rockford, Illinois

For more about these items, circle numbers on Reader Service Card next to back cover.

Tape converts fence to colorful backdrop



Does your office look upon a parking lot, or a worse eyesore, through a chain-link fence? Do your plant neighbors have a picture-window view of your scrap yard through the same kind of fence?

You can improve the view of either with Latis Glas Tape. It's a 2-in.-wide material in rolls, woven from glass fibers and vinyl-coated in color for outdoor use. Choice of colors includes green, gray, redwood, yellow, and white. Installation is simple: the tape is laced through the links of a fence and the ends are fastened with aluminum clamps.

The maker claims this material is durable, flexible, fire-resistant, mildew-proof, and won't rot, crack, peel, stretch, or shrink. Maintenance calls only for occasional hosing. Cost is 11¢ per yard, including clamps. *Bolton Industries.* (Circle 195)

Washable ceiling material

Vinyl Face Travertone adds a plastic face to acoustical tile. The thin vinyl film protects the tile from water damage. Diaphragmatic action of the film transmits sound energy into the porous tile core. Result of the combination is a material that's especially useful in plant areas where sanitation standards are high, such as dispensaries and cafeterias. Comes in white only, but can be repainted without affecting maintenance and acoustical characteristics. The material is incombustible. *Armstrong Cork Co.* (Circle 196)

Vibration isolation pads

Purpose of this material is to eliminate the need to fasten machines to floors, thus simplifying layout changes. Also, pads dampen vibration from internal and external sources. Kinetic Isolation Pads, of high-density fibrous glass, are 18-in. square, ½ in. thick and scored at 2-in. intervals for easy cutting. Separate types for light, medium, and heavy loads. *Consolidated Kinetics Corp.* (Circle 197)

198—Polyurethane tires for electric straddle-type trucks aim to reduce battery drain. Macoflex is a press-on tire, up to 12-in. diameter. In addition to providing easier steering, tire material resists most oils, greases, solvents, acids, and the like. *Maco Industries, Inc.*

199—X-ray film in rolls is handy for non-destructive testing of long sections. Types AA and M films come in 16mm, 35mm, and 70mm widths. Film is wound on 200-ft. reels with a 3-in. hole for spindle mounting in the darkroom. Easily dispensed. *Eastman Kodak Co.*

200—Expansion inserts provide electrical connections. Clinch Insert is installed after molding plastic parts such as terminal blocks and switch components. Terminal is placed over insert's protruding eyelet, then eyelet is crimped. *Phelps Mfg. Div., Heli-Coil Corp.*

Turn the page

3 reasons why General Electric Slimline is America's most popular 8-foot fluorescent

Any time you see a long, unbroken line of fluorescent light, chances are good it's a General Electric Slimline lamp. Over the years, the G-E Slimline has proved . . .

1. *You can cut parts maintenance almost in half.* A G-E Slimline system has about half as many parts as a standard 40-watt system, yet it produces the same amount of light.

2. *You get 5% higher efficiency* from General Electric Slimline lamps than from standard 40-watt fluorescents. You get more light for every dollar of electricity.

3. *You can make your place look better.* Slimlines start instantly, with no blinking. They have an excellent record of uniformity and long life because of General Electric's outstanding quality controls and manufacturing experience. Available in all popular colors.

There are 14 combinations of tube length and diameter to fit your space requirements. Specify General Electric on your next order for slimline lamps. General Electric Co., Large Lamp Dept. C-13, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

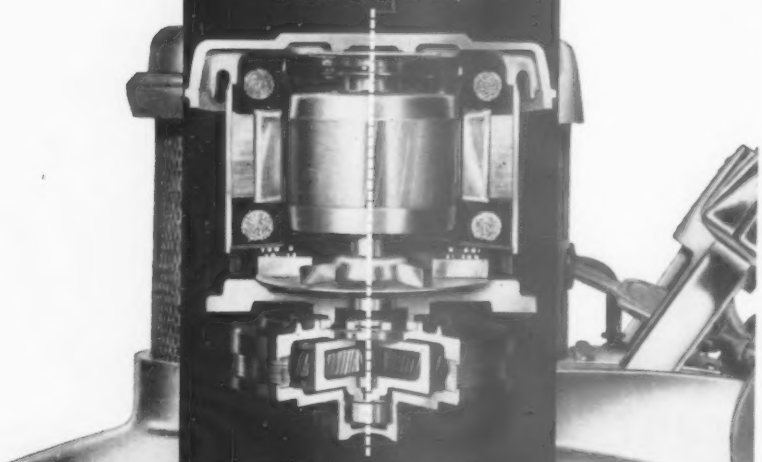
GENERAL ELECTRIC

The nearsighted MISTER MAGOO says . . . "1945? Who could forget that year? Eagle-eye Magoo was mustered out of the Aircraft-Spotting Command, and General Electric invented the slimline lamp. Happy birthday, Slimline! Zounds —they don't make these telescopes like they used to!"

For more facts Circle 563 on Reader Service Card

World's only floor machine with

CONCENTRIC ACTION



CONCENTRIC ACTION . . . means a faster, smoother, more efficient job with no operator fatigue. It results from centering all weight over the machine's exact center of gravity . . . directly transferring power down a "straight line design" of motor, gears, through the brush to the work surface. The machine self-controls its own action, eliminates bucking and whipping. More power is delivered *evenly* to the working face. The machine will operate on the toughest jobs 24 hours a day, everyday—without overheating. See it demonstrated! Pick *your* toughest job!

THE TORNADO 280 SERIES FLOOR MACHINE introduces a major breakthrough in stamina, efficiency and ease of use. Scrubbing floors or rugs, stripping, waxing and polishing are a new experience.

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FACTORY / MATERIALS NEWS

Begins on page 248

For more about these items, circle item numbers on Reader Service Card next to back cover.

201—Corrugated building panels are porcelain-enameled steel. Ridgi-Cal can be used for roofing, siding, and architectural effects. Available in standard sizes in a variety of profiles, gauges and colors. One type is an insulated-wall section. *Caloric Appliance Corp.*

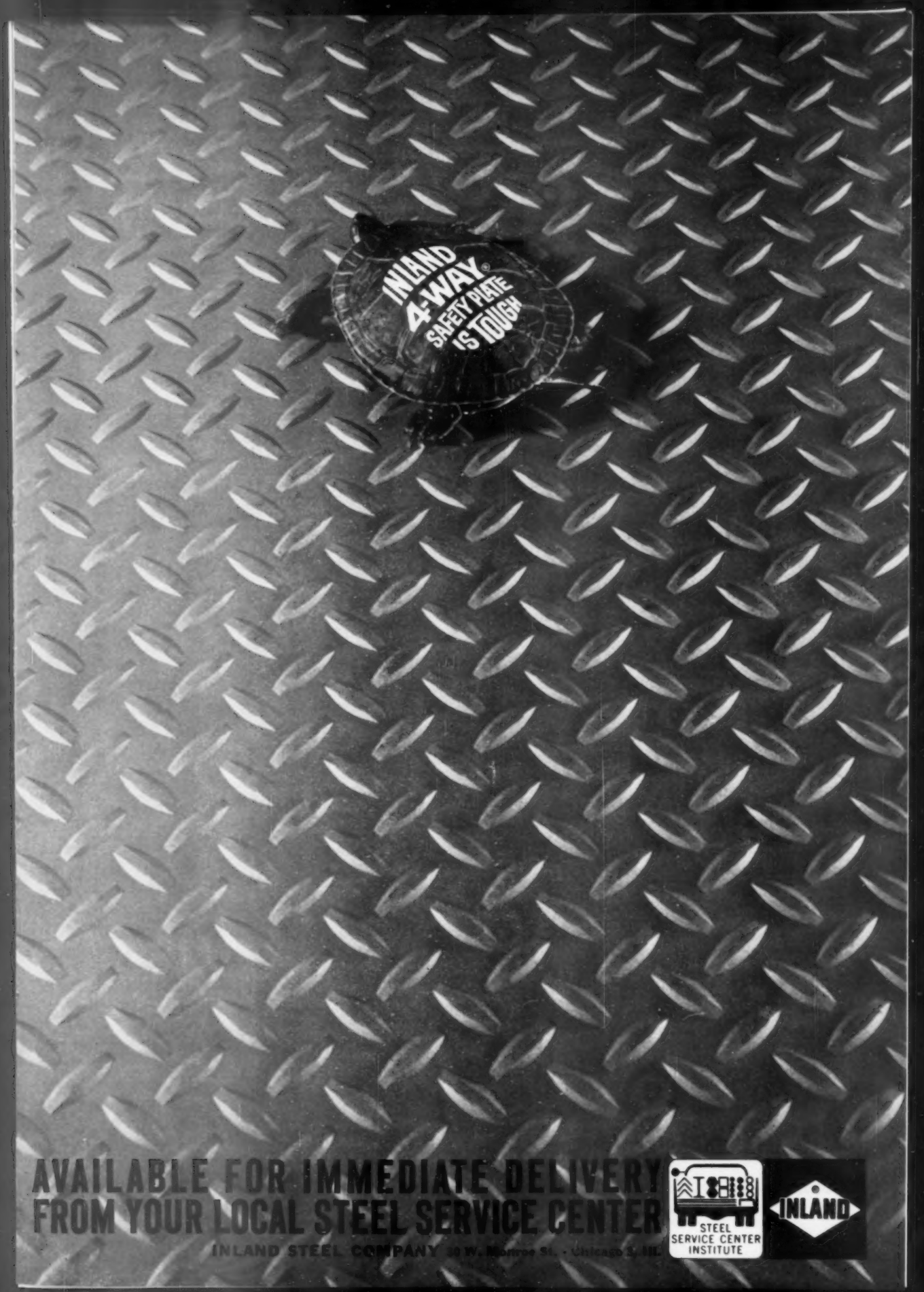
202—Masonry adhesive provides a cost-cutting opportunity when building with concrete, cinder, and lightweight blocks, and red-clay bricks. Threadline mortar is made by mixing four packaged materials, applied with caulking gun. *Adhesives Dept., Raybestos-Manhattan, Inc.*

203—Edge protection material in new ½-in. size protects narrow edges or flanges of metal stampings, wire strapping, etc. Edg-Pak comes in cushioned X-crepe, neutral X-crepe, and polyethylene-coated papers, in cut lengths or rolls. *Edg-Pak Div., Flex-O-Lators, Inc.*

204—Bulk materials loss is deterred by spraying with Compound SP-301. It forms a crust over piles of bulk materials stored outside. Crust reduces losses from wind and rain. Suitable for many materials, including sulphur, ores, coal. *The Johnson-March Corp.*

205—Spray wash cleaner can be used in all types of metal washing machines to clean steel, copper, brass, and aluminum. Sprean 66 is a powdered alkaline, formulated to provide high detergency, prevent excessive foaming, inhibit steel from rusting. *Enthone, Inc.*

Turn the page



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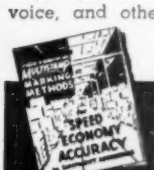

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MULTISTAMP
STENCIL DUPLICATOR (R)
THE MULTISTAMP CO. NORFOLK, VA.

FACTORY / MATERIALS NEWS

Begins on page 248

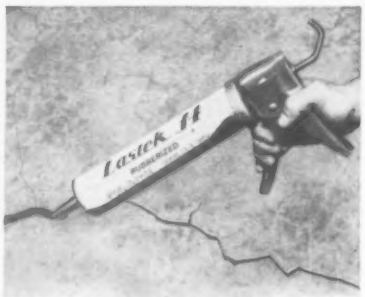
For more about these items, circle item numbers on Reader Service Card next to back cover.

206—Cleaning solvent is safer because controlled evaporation reduces solvent vapors in the air. Detergent additive speeds removal of oil, grease, carbon dust, and the like, from motors, generators, switches, other electrical equipment in place. *Turco Products Inc.*

207—Abrasive disks are fiber-backed for light grinding operations where there's little or no dressing action. They have tested well on stainless steel, non-ferrous alloys, blending of fillers, other operations. In aluminum oxide grits 24 through 50. *The Carborundum Co.*

208—Acrylic overlaid plywood is suitable for curtain walls and other structural parts of buildings. Doesn't need painting. Comes in several colors and a choice of backing. Panels are edge-sealed. Installation needs only woodworking tools. *Georgia-Pacific Corp.*

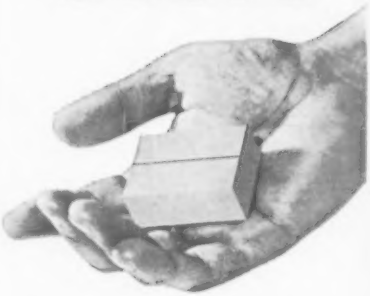
209—Insulating varnish comes in 16-oz. aerosol container and in bulk quantities. Champion Sprayon brand provides oil- and water-proof protective film for insulating windings, coils, switchboard parts, commutator ends, etc. *Champion Bronze Powder & Paint Co., Inc.*



210—Rubberized sealer for filling cracks in asphalt and concrete is called Lastek 34. It's packaged in caulking tubes, applied with standard caulking gun. The black material is suitable for cracks to ⅜-in. wide; remains elastic, adheres firmly. *Maintenance Inc.*

Turn to page 257

CUT MATERIALS HANDLING AND WAREHOUSING COSTS



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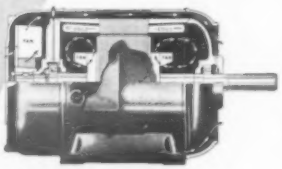

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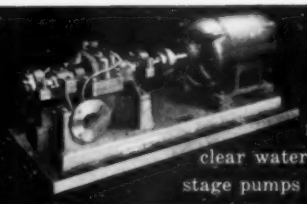

High Pressure Pumps—Ideal for boiler feed and other severe clear water service. These multi-stage pumps operate against heads to 1500 ft. Capacities to 900 gpm. For complete facts, write for Bulletin 980.

Close-Coupled Pumps—These efficient pumps save space, simplify installation. No need for shaft alignment. Vertical or horizontal models. Adjustable discharge angle. Write for Bulletin 975.

NEW! 'Buffalo' Hermetic Pumps—Quality pumps with special bearings for use where leakage would be dangerous or costly. Available in a broad range of materials of construction. Write for full details.

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Chemical Liquid Pumps—Specially designed for moving most corrosive abrasive or high consistency liquids. Your choice of many types in a variety of trim. Will withstand punishing conditions. Write for Bulletin 976.

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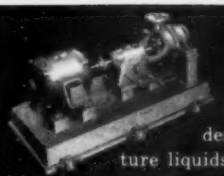

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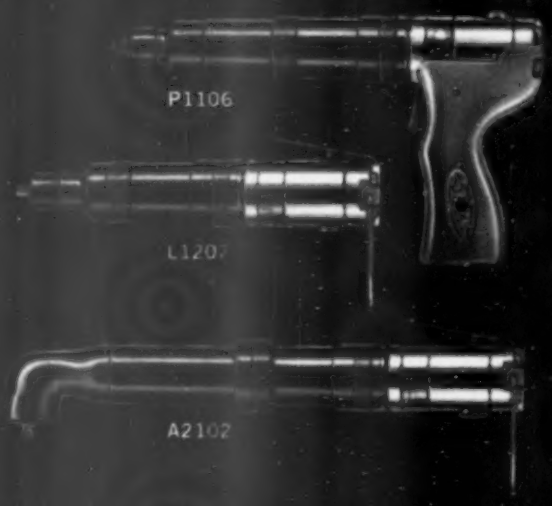

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NEW CONCEPTS IN PRACTICAL OFFICE AUTOMATION

For more about these items, circle item numbers on Reader Service Card next to back cover.

MATERIALS LITERATURE

211—Floor surface materials are described in 4-page catalog. Includes hardeners, patching, resurfacing compounds, chemical- and slip-resistant coatings for new and old wood, concrete, other floors. *A.C. Horn Companies.*

212—Tips on painting your plant inside and outside are numerous in this 16-page brochure. Covers types of surfaces, operating conditions, and application methods. Describes contrast control to improve visual comfort. *The Tremco Mfg. Co.*

213—Thermal insulations are described in 64-pager (IN-244A). Six thumb-tabbed sections cover high temperature, heating, air conditioning, refrigeration, refractory, weatherproofing, and miscellaneous materials. *Johns-Manville Sales Corp.*

214—Coated package paper samples are in a file folder describing Marvelene plastic-coated packaging materials. Samples include glassine, kraft, gold and silver foil coated with polyethylene. Lists many applications. *The Marvellum Co.*

215—Grouting methods for heavy industrial equipment are explained in 6-page Bulletin EPMG-2a. Information covers preparation, material selection, mixing and placing grout, using company's products. Illustrated. *Master Builders Co.*

216—Welding stainless steel is simplified by information in 12-pager (7300.2). Explains physical properties, structure and welding characteristics of stainless types. Chart lists electrodes for arc welding. *The Lincoln Electric Co.*

217—Water treatment for water-wash paint-spray booths is discussed in 4-page Brochure F9443. Lists seven compounds that ease problems, with range of organic and synthetic coatings. *Oakite Products.*

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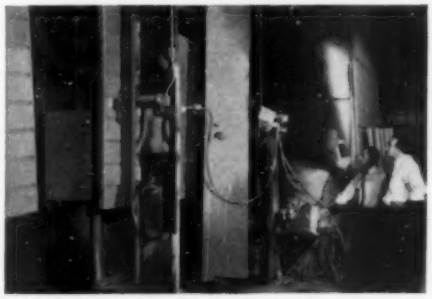
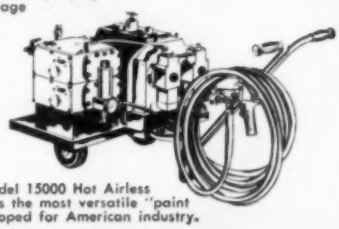


Mr. Briggs, left and Mr. Gering of Berry Door Corporation watch automatic spraying of steel garage doors.



Nordson Model 15000 Hot Airless Spray Unit is the most versatile "paint shop" developed for American industry.

"Paint costs were getting out of hand. The sales department wanted a better finish on our metal garage doors, but we were also under pressure to hold the line, costwise. After a careful investigation we switched to the Nordson Hot Airless Spray System. Results were outstanding. We effected 45 percent savings in paint and at the same time increased coverage very substantially and improved appearance. Total savings are now running better than $4,000 a month."

This is a direct report from Mr. C. T. Briggs, Chief Engineer, and Mr. L. N. Gering, Production Manager of the Berry Door Corporation, Birmingham, Michigan, world's largest manufacturer of metal garage doors.

If you spray varnishes, paints, lacquers or other industrial coatings, it will pay you to find out if the Nordson System can provide savings and improve quality for you. Write Nordson Corporation, 37 Jackson Street, Amherst, Ohio.

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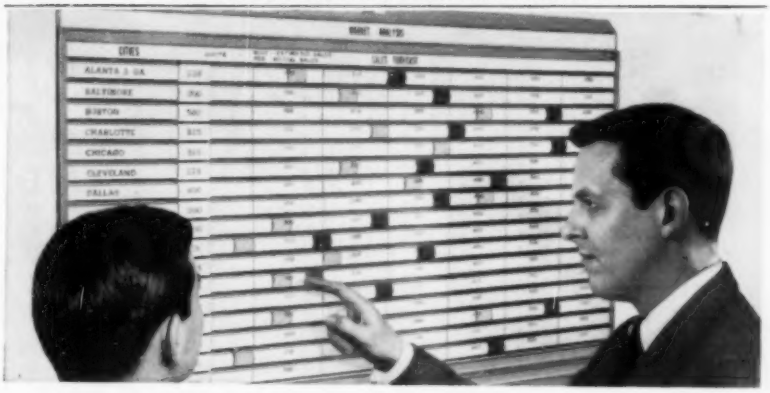
For more facts Circle 572 on Reader Service Card



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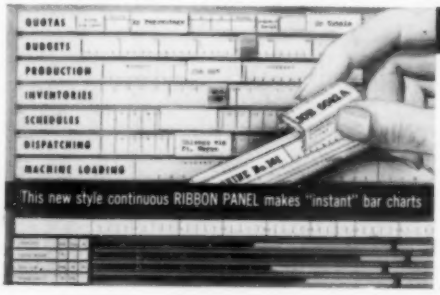

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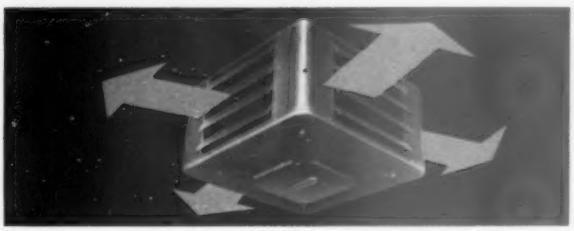
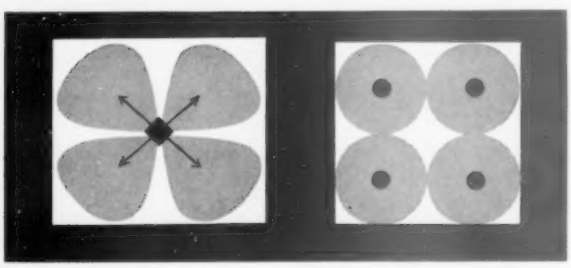
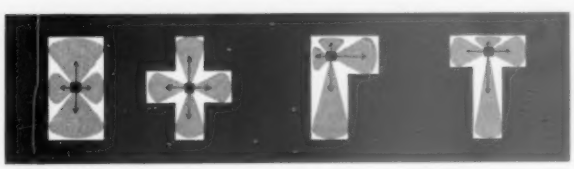
FOR VERSATILITY...LOOK TO CARRIER UNIT HEATERS!



Look! "Clover Leaf" pattern can discharge heated air in as many as four directions at once. One Carrier 4-way heater can be used to do the job of two or more vertical discharge units—or four to six horizontal units.



Look! Using all four of its outlets, the largest Carrier 4-way unit can heat a room over 100 feet square. It takes several vertical discharge heaters to do this same job.



Look! Adjustable louvers make it easy to vary the shape of the "Clover Leaf" air distribution pattern. Without changing outlets or adding accessories, it can be used to heat L, T, I or square-shaped areas.

For a new plant or for modernization, Carrier "Clover Leaf" Unit Heaters can save money three ways—lower installation costs, lower operating costs and lower maintenance costs. Available in eight sizes from 55,000 to 600,000 Btuh . . . for steam or hot water. Carrier offers every type of equipment for any commercial or industrial job: Heat Diffusers and Heating and Ventilating Units for steam and hot water; Unit Heaters for steam and hot water; Gas-fired Unit Heaters and Duct Furnaces. For complete information, call your Carrier representative listed in your Classified Telephone Directory under "Heaters—Unit." Or write Carrier Air Conditioning Company, Syracuse 1, N. Y.

Carrier ***Air Conditioning Company***

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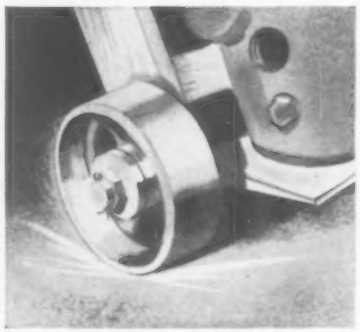
HORN **DURAFAX**



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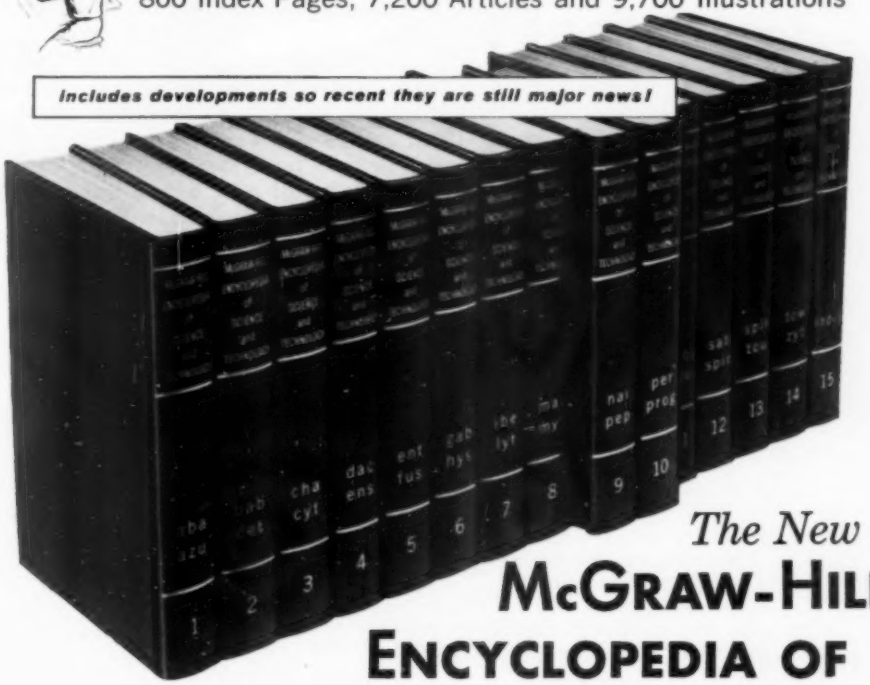

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Want to relieve your work load?

The true purpose of staff aids to the line organization is to relieve the work load of the line managers. That's the viewpoint expressed in an intriguing new book, *Staff in Organization*. It's written by two of the leading students of management who are, in fact, idol-wreckers of the old school.

It is the position of authors Ernest Dale and Lyndall Urwick that staff assistants should come in two varieties: (1) specialists who direct intensive attention to a specific "ancillary" function, such as quality control; and (2) assistants who act as communicators and clearing houses for the welter of information and the numerous activities that must be coordinated.

"Gone are the days when a business could be operated like a country store," says the authors. "Gone are the days when the president of one of our largest companies could say 'line are all those people who procure the material, cut it up, put it together and ship it out, while staff are the people who prevent these jobs from getting done.' "

The authors are witty and urbane. They can call up incisive examples from all sorts of businesses. But in the main, they draw heavily from the military concept of a general staff. This concept is closely allied to the concept of a professional manager. The manager of staff is not a specialist in that function. Nor does he have any direct responsibility to higher management for the function he supervises. The line executive (production manager, for instance) is always held accountable for the work of his staff. The staff man is selected for his vigor in carrying out the line manager's objectives. Consequently, there is a high premium put upon the staff man's skills as a communicator, coordinator, and interpreter.

While part of the general staff concept is observable in manufacturing situations, the authors deplore the infrequent use of the "assistant" as a staff aid. They project this use all the way from the top executive level right down to the first-line supervisor. In manufacturing, most readers are inclined to draw a parallel between this "assistant to" and the "administrative assistant," the "detail" man, or even the "production control" department.

This book is provocative, interesting, and contains useful ideas that a creative manager can translate into applications in the plant. (Reviewed by Lester R. Bittel)

Staff In Organization, by Ernest Dale and Lyndall F. Urwick. McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36. 241 pages. $6.

Saying what you mean

"I don't get it." Or perhaps indicating a more serious situation: "But I thought you meant something different." You'll hear these statements, or others to the same effect, in every plant nearly every day. They're symptomatic of failures in communication—in passing information from one person to another, or to others in management. Management is dependent upon communication in all its forms—letters, reports, and oral presentations—to perform its function. Yet management's aggregate skill in communicating generally suffers by comparison with its other skills.

Communicating skills can be improved, and the improvement can help management do its job better. Serious study of this book, *Technical Communication*, and use of what it teaches can help anyone improve his skill in transmitting information and thoughts clearly. It can help individuals. It can be used in a communication training class.

This book covers all forms of communication used in industry. It treats each form separately, using practical examples to guide the reader in application of principles and techniques. A feature of the book is its discussion of reports. The author classifies all reports in a

PPG Fiber Glass Pipe Insulation is slit lengthwise, slips easily on to pipe. Delaware Insulation Company installed 15,000 ft of PPG Pipe Insulation in the new Wilmington High School, reported excellent working characteristics.

"We can install PPG Fiber Glass Pipe Insulation 15% faster than other pipe insulating materials"

says Mr. Anthony Kotowski, foreman, Delaware Insulation Company, Wilmington, Delaware

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"We like PPG Fiber Glass Pipe Insulation because it's flexible and workable. We bend it around pipe hangers, mold it to shape easily, smooth it, then fasten and bind it," continued Mr. Kotowski as he discussed the PPG installation in a Wilmington High School. "You can't do that with other insulations. They're too brittle, require cutting, and sometimes break when you're working with them.

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few basic types, explains how to organize and write each. This approach will help plan a report more quickly and easily. Also included are chapters on writing, development and use of illustrative material. (Reviewed by Robert S. Rice)

Technical Communication, by George Harwell. The Macmillan Co., 60 Fifth Ave., New York 11. 332 pages. $5.

Pump handbook thoroughly covers centrifugal pumps. Twenty-seven chapters present information that will be useful to pump users and buyers, as well as designers. This book is light on theory; it emphasizes practicality. It aims to provide an understanding for the solution of specific problems in planning, selecting, operating, and maintaining pumps and pumping systems.

Centrifugal Pumps: Selection, Operation, and Maintenance, by Igor J. Karassik and (the late) Roy Carter. F. W. Dodge Corp., 119 W. 40th St., New York 18. 488 pages. $15.75.

Small plant management techniques have undergone many changes since 1950. That's when the first edition of this popular book was published. The revised second edition adds new information. The material is based on an ASME study of small plant activities and includes such topics as finance, organization, sales planning, labor relations, legal requirements, and research.

Small Plant Management: A Guide to Practical Know-How Management, edited by W. A. MacCrehan. Second edition. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36. 560 pages. $10.50.

Preventive maintenance manual covers PM organization, systems and procedures, records, work measurement, and mathematical techniques. This paperback also includes sections on how to manage and evaluate a PM program.

Management Guide to Preventive Maintenance, by Bernard T. Lewis and William W. Pearson. John F. Rider Publisher, Inc., 116 W. 14th St., New York 11. 58 pages. $1.25.

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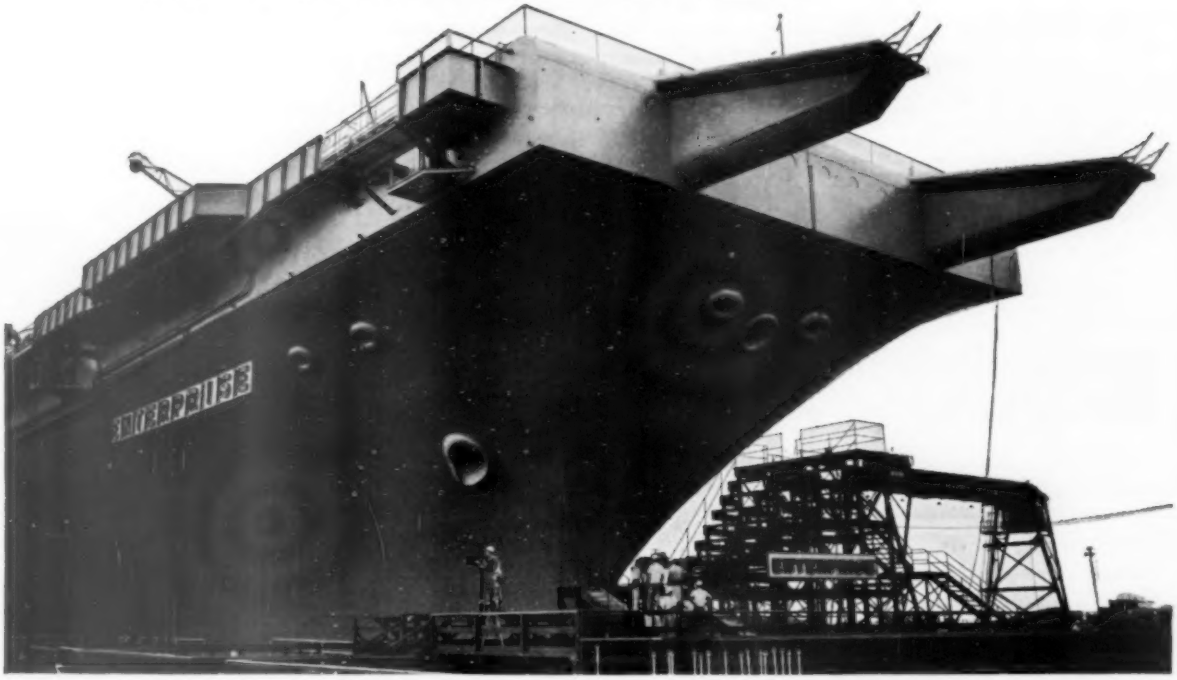

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Work Simplification in shop operations is a 28-page folder that lists 88 16mm films available for rent. These films have won awards in the annual Methods Improvements Competition sponsored by the Industrial Management Society. For free copy of folder, write to:

Industrial Management Society, 330 S. Wells St., Chicago 6.

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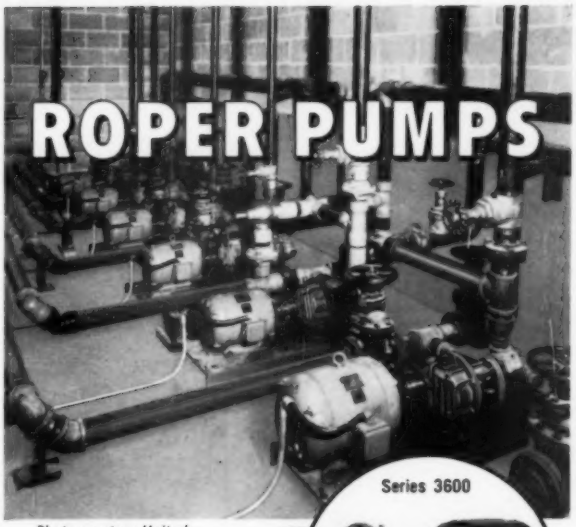

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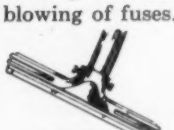

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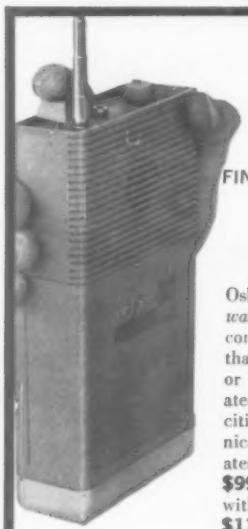

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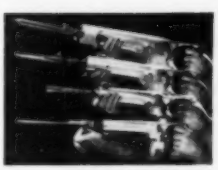

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ADVERTISERS' LITERATURE
FEATURED IN THIS ISSUE

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

ELECTRICAL

275—Motor starters. Bulletin SM-292 (illustrated) gives complete data. Sizes from 0 through 4. Square D Co.

276—Lighting fixtures. Write for latest lighting design and fixtures catalogs. Sylvania Lighting Products Inc.

277—Plug-in duct. Bulletin SD-110 gives many facts and features of aluminum plug-in duct. Square D Co.

278—Motor starters. Bulletin 709 tells about new line of motor starters. Sizes 00 through 5. Allen-Bradley Co.

279—Push-buttons. Booklet GEA-7320 on new single-circuit contact blocks for push-buttons. General Electric Co.

280—Motor control center. Publication LJ-1-G211 gives facts on selecting proper control. Cutler-Hammer, Inc.

MATERIAL HANDLING

281—Conveyors. Catalogs covering every type of conveyor for specific applications is yours on request. Link-Belt Co.

282—Batteries. Booklet "Why We Use Battery-Electric Industrial Trucks" gives facts. Gould-National Batteries, Inc.

283—Containers. Illustrated brochure shows complete line of containers for various applications. G. B. Lewis Co.

284—Hoists. Here's literature on line of electric and air hoists, chain blocks. Manning, Maxwell & Moore, Inc.

285—Storage racks. Catalog gives facts on slide-and-lock adjustable racks. American Metal Products Co.

286—Tramrail systems. Here's a booklet (No. 2008) with data on overhead cranes. Cleveland Tramrail Div.

287—Tote boxes. Catalog outlines features of durable molded glass-fiber boxes. Molded Fiber Glass Tray Co.

288—Truckster. Full details and cost analysis report on 18-hp. engine Truckster. Cushman Motors.

289—Steel shelving. Fact-packed catalog on rapidly assembled shelving. No bolts needed. Borroughs Mfg. Co.

290—Conveyor hoods. Bulletin 61W on hoods of curved, corrugated sheet metal for conveyors. Elwin G. Smith & Co.

291—Self-dumping hoppers. Literature tells how to cut handling costs by 50%. Eight sizes. Roura Iron Works, Inc.

292—Gas lift trucks. Send for data on trucks. Capacities: 3000 to 10,000 lb. Automatic Transportation Co.

293—Strapping tool. Information on new air-powered Model 7300 stretcher for steel strapping. U. S. Steel Corp.

294—Fork-lift trucks. Catalog lists more than 40 standard models—1 to 20 tons. Elwell-Parker Electric Co.

295—Casters, wheels. New manual describes over 4000 types of casters and wheels. Darnell Corp., Ltd.

296—Scales. Bulletin 2036 gives complete facts on types, capacities for various applications. Toledo Scale Corp.

297—Traveling cranes. Bulletin 5000B covers custom-engineered overhead electric cranes. Conco Engineering Works.

298—Stencil duplicator. New illustrated how-to (and why) book is free—gives many facts. The Multistamp Co.

299—Containers. Catalog lists line of containers made of tough vulcanized fiber. National Vulcanized Fibre Co.

300—Pneumatic conveying. Booklet 143B covers conveying system for bulk materials. Spencer Turbine Co.

BUILDING

301—Colorado. Here's a portfolio of nine booklets on "Industrial Colorado." Colorado Dept. of Development.

302—Roof coatings. Write for booklet, "Aluminum Roof Coatings Make Time Stand Still." Aluminum Co. of America.

303—Flooring. This bulletin gives full details on an anti-slip flooring compound. Mine Safety Appliances Co.

304—Smokestacks. New bulletin gives data on glass-protected stacks. Come in eight colors. A. O. Smith Corp.

PRODUCTION

305—Drill press. Brochure contains complete specifications on new 17-in. model, accessories. Rockwell Mfg. Co.

306—Magnetic separators. New bulletin tells how to get protection against dangerous tramp iron. Eriez Mfg. Co.

307—Heat exchanger. Bulletin P60 contains details on structural features and applications. Tranter Mfg., Inc.

308—Schedule boards. Booklet X-400 (24 pages) shows applications of visual control boards. Graphic Systems.

309—Die grinder. Here's information on heavy-duty grinder for metal removing. Cleco Div., Reed Roller Bit Co.

310—Heat exchangers. Bulletins 120 and 132 describe self-contained fluid cooling systems. Niagara Blower Co.

311—Air grinders. Send for "Portable Tool Productivity Analysis" to check grinder efficiency. The Rotor Tool Co.

312—Industrial TV. Write for copy of closed-circuit TV system-planning guide. Gives applications. Philco Corp.

313—Safety containers. Catalog has ideas for handling solvents in production applications. Protectoseal Co.

PLANT SERVICES

314—Drum tops. Full details plus drum-top kit for converting old drums to waste receptacles. Bennett Mfg. Co.

315—Work clothes. Catalog lists permanent flameproof work clothing for hazardous jobs. M. Setlow & Son, Inc.

316—Dust collectors. This folder lists 46 standard models, to service one to 19 machines. Aget Mfg. Co.

317—Water gates. Catalog lists sluice, slide, flap, roller, other gates. Armco Drainage & Metal Products.

318—Emergency lighting. Booklet "The Odds On Emergency Lighting" tells how Light Warden works. Electric Cord Co.

319—Steel equipment. Catalog 100 (100 pages) describes and illustrates diversified line. Lyon Metal Products, Inc.

320—Compressor. Bulletin HAC-40 gives complete details and features on heavy-duty type. Gardner-Denver Co.

321—Plug valves. Bulletin V-621 covers Multiport valves for gas, liquids and slurries. Rockwell Mfg. Co.

322—Meters. Bulletins P-100, PI-666, OG-400, and 1085 on measuring liquids and gases. Rockwell Mfg. Co.

323—Regulators/valves. Bulletins 1044, 1059, 1082, 1086 cover regulation of gas pressures. Rockwell Mfg. Co.

324—Compressors. Bulletin SG-3 describes unit type, ½-15 hp.; stationary, 25-100 hp. Westinghouse Air Brake Co.

325—Pumps. Booklet "How to Solve Pumping Problems" in handling transfer of liquids. Roper Hydraulics, Inc.

Turn the page

DRAWING BOARD NEWS.....No. 3

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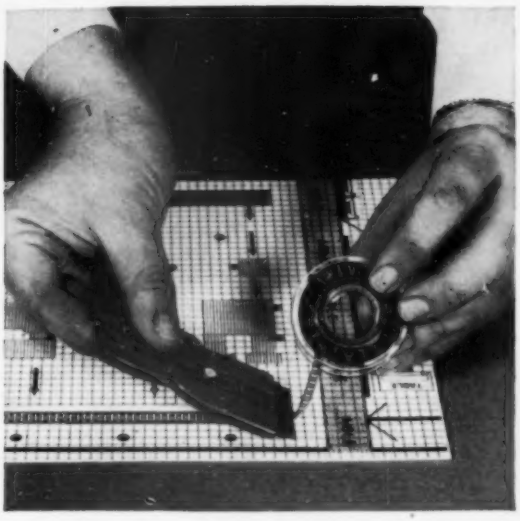
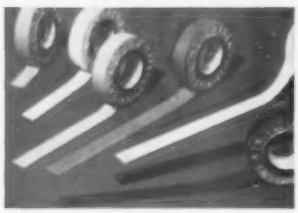
Beginners make neat, reproducible drawings, graphs and charts with Chart-Pak. Skilled draftsmen find it makes their work more productive — more fun!





New Matte-Surface Tapes "Show Without Shine!"

The "flat," matte surface on these new Chart-Pak acetate fibre tapes photographs beautifully, without highlights or glare — is easy to write on, with pen or pencil.

On top of that the tape is thin, to eliminate edge shadows—won't shrink, discolor, or peel.

Available in ten colors, in "regular" (1/8" to 2" widths) and "curve-line" tapes (1/64" to 3/32" widths, accurate to plus or minus .002".)

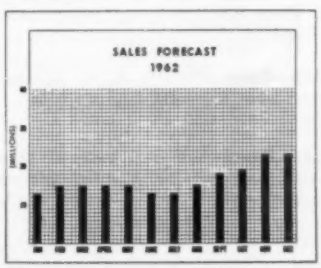
New! "Tape-Saver" Package

SQUARED-OFF TRANSGRID SHEETS MAKE QUICK WORK OF GRAPHS, CHARTS

You mount Chart-Pak materials fast, where you want them, on Transgrid transparent planning sheets — strip them off later, to use sheets over and over again.

Transgrid is made of tough, stable DuPont "Mylar"®, printed with 1/4"-interval grid lines of black, orange, or non-reproducible blue. It comes by the yard.

If you need heavier, opaque planning boards, Chart-Pak has them, too — as well as new, self-spacing lettering, for titles.



Write for this new 32-page Chart-Pak catalog of materials that help make drafting easier . . .

"Couldn't Do Without It" says Supervisor of Visual Aids, American Cyanamid Co.

Visual aids experts serving this great company have used Chart-Pak for eight years. They report it cuts their preparation time 25%.

Popular everywhere . . .

A partial list of Chart-Pak's other big customers includes — American Bosch Arma; the Budd Company; Grumman Aircraft; Florida Power & Light; Kaiser Aluminum & Chemical Corp.; Michigan Bell Telephone; Smith, Kline & French Laboratories; Union Carbide. There are many, many more.

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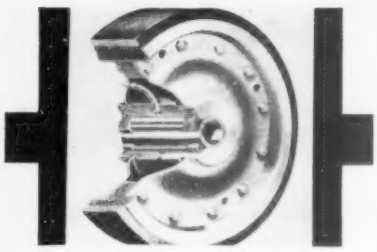

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270 **Circle 588 on Reader Service Card**

ADVERTISERS' LITERATURE FEATURED IN THIS ISSUE

Begins on page 268

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

326—Air conditioning. Catalog 518 describes complete line of component products. American Air Filter Co.

327—Shelving/lockers. Booklet, "12 Losses Penco Planning Can Control" yours on request. Alan Wood Steel Co.

328—Dust collectors. Bulletin 372D has information for dust and fume control problems. Wheelabrator Corp.

329—Mixing valves. Bulletins V-214 and V-215 describe features of three-way mixing valves. Johnson Service Co.

330—By-pass valves. Bulletins V-210 and V-211 give details and maintenance features. Johnson Service Co.

331—Dust control. Here are folders on seven types of collectors, 166 different models. The Day Co.

332—Acoustic panels. Folder tells how use of panels can solve sound-control problems. The Eckel Corp.

333—Activated charcoal. Bulletin T-362 covers filtering agent for air, gases, and liquids. Barnebey-Cheney Co.

334—Vacuum systems. Catalog 155B gives details on complete systems for dust control. The Spencer Turbine Co.

335—Air filters. Bulletin 108A and "Air Conservation Engineering" on air purification. Connor Engineering Corp.

336—Motivation kits. Employee motivation kit includes 50-page guide for planning program. Elliott Service Co.

337—Vertical pumps. Here are bulletins on new vertical pumps with ultra-high flow design. Worthington Corp.

MAINTENANCE

338—Lubricants. Folder, "How to Starve a Scrap Pile," describes organized lubrication program. Texaco Inc.

339—Paint. Booklet, "Color Dynamics," tells what it is and how it's used. Paint Div., Pittsburgh Plate Glass Co.

340—Engineered maintenance. This 16-pager outlines benefits of programed housekeeping. Puritan Chemical Co.

341—Paint. Write for catalog on New Color Horizons System. Has color charts, applications. Rust-Oleum Corp.

342—Lubricants. Lubriplate Data Book is an informative treatise on lubrication. Lubriplate Div., Fiske Bros.

343—Oilers, cans. This catalog shows complete line. All styles and sizes for every purpose. Eagle Mfg. Co.

344—Scaffolds. Descriptive circulars give full facts on aluminum scaffold-on-wheels. Up-Right Scaffolds.

345—Paint. Catalog has information on scientific protection of floors, walls, etc. Truscon Laboratories.

346—Floor machine. Here's a bulletin with photos, performance, and other data on new K-4 model. G. H. Tennant Co.

347—Paint. You'll want details on new dri-spray aluminum paint. No need for drop cloths. Tropical Paint Co.

348—Window washer. Here are details, with free trial offer, on one-man "high" window washer. Tucker Mfg. Co.

349—Paint. Bulletin P-57 contains data on metal coat, high-gloss enamel, primers. The Wilbur & Williams Co.

350—Paint sprayer. Bulletin A98-11 gives complete information on new airless spraying outfit. Binks Mfg. Co.

351—Paint. "Quick Reference Painting Guide" and book "How to Reduce Painting Costs." Barreled Sunlight Paint Co.

352—Packings. Catalog describes self-lubricating packings for pumps, presses, other equipment. Greene, Tweed & Co.

MECHANICAL

353—Speed reducers. Books 2618, 2718 on reducers adaptable to endless number of applications. Link-Belt Co.

354—Flexible couplings. Bulletin gives complete technical data on three types of Para-flex. Dodge Mfg. Corp.

355—Speed reducers. This 28-pager (M-140) contains illustrations, charts, and tables. Perfection Gear Co.

356—Pillow block bearings. Bulletin 106 covers bearings in shaft sizes ¾ to 2 15/16 in. Hoover Ball & Bearing Co.

357—Worm gear reducers. Catalog WG-60 gives facts, including torque control feature. Philadelphia Gear Corp.

358—Belt drives. Bulletin 23103 gives data on drives—V, variable speed, timing, others. T. B. Wood's Sons Co.

359—Bearings, pulleys, take-ups. Bulletins give ratings, sizes, and other technical data. Dodge Mfg. Co.

According to Mr. David Greene, of A & G Welding:

"Bitumastic solved our coating problem without delaying our production"

"Part of the reason for the excellent reputation of our swimming pool filters is their long service life," says Mr. Greene, president of A & G Welding and Boiler Co. in South Kearny, N.J. "And protection of the steel interior of these filter tanks against corrosion is an important factor in obtaining this long life," he continues.

A & G tried numerous coatings before selecting Bitumastic® Tank Solution for the job. Some coatings—even more expensive materials—failed due to undercutting; others just took too long to apply and dry, a drawback from the standpoint of maintaining efficient production. Now, tank heads are hand-brushed and the finished, fabricated tank is coated through a port with a specially designed spray gun. The tight, uniform coating film formed by Bitumastic Tank Solution gives long-lasting protection. And, since this coating was specially formulated for potable water applications, it imparts no taste or odor to the pool water processed by the filter.

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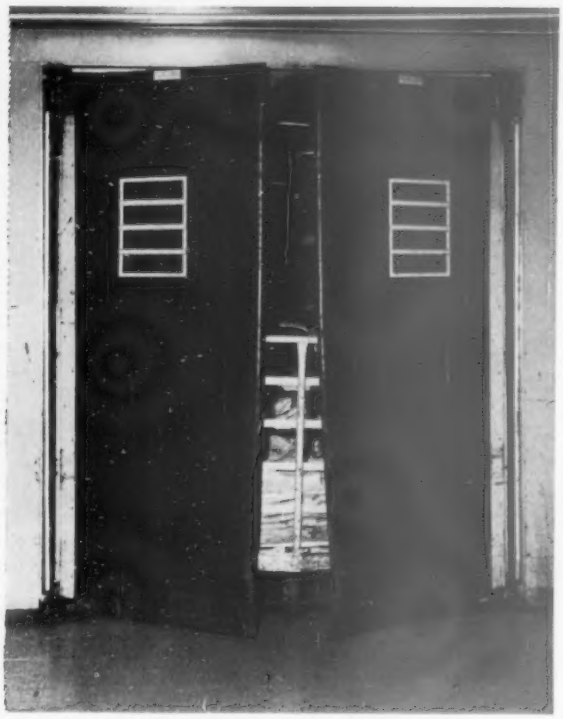

One of the Rubbair Door installations at the Main Post Office, Washington, D. C.

U.S. POST OFFICE

Washington, D. C.

The above illustration shows an unretouched photo of just one of the Rubbair Door installations at this location. Other installations are at Post Offices in the following locations: Baltimore, Md., Atlanta, Ga., Newark, N. J., New York City, Staten Island, N. Y., Houston, Texas, Chicago, Ill., Lansing, Mich., St. Paul, Minn., and St. Louis, Mo. This listing or illustration is not to be construed as an endorsement by the Post Office Department.

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Use one standard cable for most multi-conductor jobs

You can now get quick delivery on *standard* control cable from Rome in any combination of:

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- 1 to 37 conductors
- No. 10 or No. 12 AWG stranded copper conductors

These CT cables are lighter, smaller, more flexible than standard rubber types. Each conductor is insulated with polyethylene for maximum dielectric capability, particularly where moisture, acids, alkalies or oils are problems.

The conductor and cable jackets are Synthinol (polyvinyl chloride), providing mechanical protection and added resistance to heat, flame, chemicals and corrosion.

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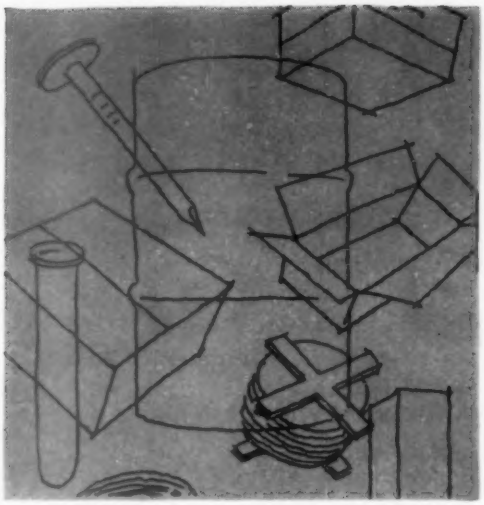

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FAIRBANKS-MORSE BENCH AND PORTABLE "FLOAXIAL" DIAL SCALES

Now you can "check weigh" anything for industry (from a one-pound can to a one-ton barrel), in, out, or all about more accurately—more economically! Modern Fairbanks-Morse Dial Scales provide proved accuracy that works for you, year after year. And—because our Scales are built to last longer, you realize long-life economy . . . freedom from repairs or early replacements!

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Your building services and security can now be monitored and controlled from one centralized location. For example, one man can monitor boilers, start and stop motors and check liquid level controls. An alarm system (below) signals equipment malfunctions and any number of electronic security devices, such as the W271A Sono-Sentry*, can be connected to the central panel to sound an alarm at the first sign of trouble.

Centralized control minimizes the possibility of human error, frees guards and other employees for more productive work and virtually eliminates losses from fire, theft or vandalism. For further information, call your nearest Honeywell office. Or, send the coupon below.

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Equipment/Surveillance Alarm. System detects and signals malfunctions for such typical applications as multiple-boiler power systems, supervising combustion, refrigeration, and compression.

W271A Sono-Sentry Motion Detector. Sounds an alarm when unauthorized persons move into restricted area. May be used with local alarm or remote control panel. Key switch permits authorized persons to enter under controlled conditions.

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274 **For more facts Circle 593 on Reader Service Card**

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IS YOU!

And since doctors estimate that one in four of us will develop cancer at some time in our lives, what better investment than to learn how to guard yourself against it? More than a million Americans are alive today, cured of cancer, because they went to their doctors in time.

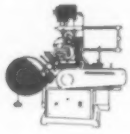
For more information, call our nearest office or write to "Cancer" in care of your local post office.

AMERICAN CANCER SOCIETY®

FACTORY

do you know how much it costs to label your products?

You know the costs of the labels themselves and the labor to apply them — but there are some other "costs" as well, whether you buy labels or make them yourself. How many become obsolete before you've had the chance to use them — and how much money do you have invested in label inventory and storage space? Can you easily and inexpensively change from one label — or one imprint — to another as demand requires — or should you add in the inconveniences and cost of delays while you wait for new labels? Another "cost" consideration, in every sense of the word, is the informing, selling and reordering job your labels are doing: if they lack readability, completeness and lasting attractiveness, they're probably more of a liability than an asset.



Model 126 — one of 80 Markem machines. From low cost blank stock, produces complete professional quality paper or fabric labels in one or two colors; allows imprint changes in seconds; makes 70-100 labels/min.

We make machines, type and inks for printing all kinds of labels. (We also make many other machines for marking products, parts and packages *directly*, when that method is more practical than labeling.) The offer we make is simple and could save you several thousand dollars a year: send us some of your labels and if we can't show you a better method that will give you informative, good-looking labels *at the lowest cost*, we'll certainly recommend that you stay with what you have now. Thousands of firms use Markem methods to save money and get better labels. Perhaps you can, too. Markem Machine Co., Keene 18, N. H.

HELPING YOUR PRODUCT SPEAK FOR ITSELF **MARKEM**

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- Assemble reference material on current plant problems
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- Add supplementary supporting data to your reports and proposals
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If you're uncertain about what lies ahead, take a good look at the white line. It represents America's past production rate and economists' estimates of future production, with the peaks and valleys smoothed out. Over the long pull the curve keeps rising.

In fact, American production more than doubles every 20 years.

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Judging by past experience, two million more businesses will be established to make and distribute our growing production during the next 25 years. Whole industries will emerge to turn out the new products that are coming from the laboratories. America has a brilliant future but to realize it fully, we must all work together for the common good.

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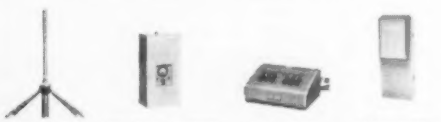
SELECTIVE WIRELESS PAGING SYSTEM



Remember . . . your Stromberg-Carlson Communications Consultant is only a local phone call away from you. He will be glad to analyze your communications problem and give you every possible help without obligation.

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A DIVISION OF **GENERAL DYNAMICS**

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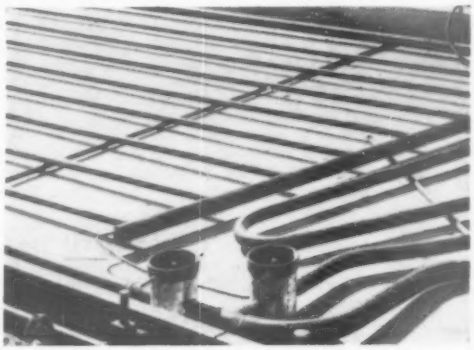
At Heinz—cleanliness starts with sidewalks kept spick and span with **steel pipe** snow melting

In Heinz plants throughout the world—cleanliness is a prime requisite. And cleanliness at Pittsburgh headquarters begins with the sidewalks . . . sidewalks which are kept free of dirt-tracking snow, slush and ice throughout the winter.

The above photograph of the Heinz sidewalks demonstrates *steel pipe* snow melting at its best. It was taken when traffic came to a standstill after a storm dumped 12″ of snow in 12 hours onto streets. Yet 1 hour after the storm—walks were clean; 3 hours later, dry as a bug in a rug.

No wonder *steel pipe* is first choice for snow melting systems. *Steel pipe* is not only efficient . . . it's economical, easily available, easy to work and join, load supporting. Important, too, *steel pipe* is compatible with most materials. These same advantages make *steel pipe first choice* for plumbing, vent and drainage lines; for electrical and communications conduit; for ice making, refrigeration and fire prevention systems; for gas, air and water transmission; and for structural and construction uses.



In steel pipe snow melting systems, straight lengths and coils can be quickly joined on the job. Because the expansion coefficients of concrete and steel are almost identical, concrete cracking due to expansion and contraction is minimized.

Want to know more about snow melting systems? Send for the 32-page booklet, "Steel Pipe Snow Melting and Ice Removal Systems". Write today.

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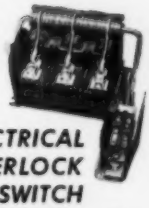

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